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NOTES

FROM THE

ROYAL BOTANIC GARDEN,

EDINBURGH.

VOL. V.

Including Numbers XXI.–XXV.

1909–1912.

Roy. Bot. Garde
1912

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Pages 57 and 58 *passim*—*for* Bennet *read* Bennett.
Page 57, last line—*for* Lee's *read* Lees'.
Page 58, line 24—*for* Berkley *read* Berkeley.
Page 58, line 36—*for* Fieldon *read* Fielden.
Page 123 and following—*for* Frmscher *read* Irmscher.

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On the Further Development during Germination of Monocotylous Embryos; with special Reference to their Plumular Meristem.

BY

W. EDGAR EVANS, B.Sc.,
CARNEGIE FELLOW IN BOTANY.

With Plates LIII–LIV.

INTRODUCTION.

THE germination of seeds, though by no means a neglected subject, is one which still requires much investigation. The chemistry and biology involved in the solution and absorption of perisperm and endosperm; the further development of the embryo both during and after germination, especially from the standpoint of phylogeny; and the effects produced on this by differences in the environment of the seed at the time of germination—for example, deep as compared with shallow sowing, the results of chemical or physical stimulation, and the like,—these are a few of the lines of research which seem most likely to repay fuller study. Moreover, it must not be thought that such problems need no more consideration because good work relating to them has been already published, for it will be found on examination that the gaps in our accurate knowledge often exceed the knowledge itself, making it even yet impossible to definitely or satisfactorily answer many an important question arising from the study of germination.

Our information regarding the relation which leaf and stem bear to one another is an excellent example of this state of affairs, for there are at the present time two schools of botanists holding diametrically opposite views on the matter. Those of the first consider the leaf an essentially lateral structure; it has been evolved as a lateral outgrowth from the stem which bears it, while leaf-like organs which seem terminal in origin must be regarded in either of two ways—they are only apparently terminal, or they are not homologous with leaves. Botanists who uphold the second school maintain, on the other hand, that the leaf was originally terminal; each successive leaf arose from

[Notes R.B.G., Edin., No. XXI, August 1909.]

the base of that which preceded it, while the axis was in course of time derived from their superposed basal portions. In this way, it is argued, the leaf became pushed to one side and assumed the lateral position which it occupies to-day ; its development gradually became arrested, and by lagging behind the succeeding internode it now appears lateral in origin.

In the seedlings of certain monocotyledons—for instance, *Juncus*, *Sparganium*, and *Pistia*—it has been shown that the first few leaves arise one from the base of the other, and that to begin with there is no axis visible. Very soon, however, it can be seen making its appearance, at first hardly discernible, but more and more prominent as each successive leaf is produced, till finally the leaves arise upon it in quite the normal way. Just as the zoologist has found impressed on the developing mammalian embryo the shadow of its phylogeny, so do these botanists who believe in a terminal leaf see a proof of their theory in the ontogeny of such a seedling. Against this it is argued that a fuller investigation will probably show that the conditions existing in those unusual cases can be best explained as arising from a more or less complete arrest or even suppression of the axis ; and since the species in which the peculiarity has been noted are chiefly hydrophytes and geophytes, it is suggested that the œcological conditions which have given rise to such types of vegetation may also tend to produce this sort of seedling structure.

At the suggestion of Professor Bayley Balfour, I began, in the autumn of 1905, a careful investigation of the structure of monocotylous seedlings at various stages during and after germination ; and also of embryos taken from ripe seed. Since then the greater part of my time has been occupied by the work, and I have collected a large amount of material, much of which has now been carefully examined. The effect of deep and shallow seed-sowing upon the various organs of the young seedling, and the development of the plumular meristem, have in particular been kept in view, not only when germinating the seed, but also in the cutting and examination of sections. The object of this paper is to put on record some of the results obtained, chiefly as regards the latter question.

After some thought I have decided that the best way in which to avoid confusion is to select a small number of the plants examined, to describe these fully, and to give in each case a list of those species which, in the matter of their plumule, resemble the type chosen. An attempt has been made to so arrange the examples that they may form a series, beginning with one in which the leaves always appear lateral, and ending with as extreme a case of stem suppression—if indeed it be such—as

possible. The account of each will be complete in itself, and reference will there be made to any papers relating to the plant under discussion. A final chapter will be added in which the whole question will be reviewed and conclusions drawn; this will include a more general bibliography. I believe that in this way a clearer view of the whole subject will be secured than in any other, for, while there are very few plants whose germination is perfectly identical, there are several well-marked types of germination amongst monocotyledons, which might be lost sight of if too many examples were taken in detail.

A few remarks on the methods I have employed in germinating seed; preserving, cutting, and mounting specimens for the microscope; and in producing the photo-micrographs which illustrate the paper, may be of use to other workers.

Germination of the seed.—Seed was successfully germinated on the surface of absorbent material such as blotting-paper and cocoanut fibre. Better results were obtained, especially with certain species, by placing the seed in pots of light sandy soil, the depth of sowing being equal to the thickness of the seed. A germinating case was experimented with, but was not so successful as a properly constructed propagating house. In many instances it was found necessary to specially arrange the position of the seed, so that the young plant might develop as far as possible in one plane, otherwise good sections could not be obtained.

Fixing the specimens.—A mixture of two parts of absolute alcohol and one of glacial acetic acid proved thoroughly satisfactory, and enabled fixation to be rapidly and easily performed. The specimens were allowed to remain about twenty minutes in this reagent, were washed in 90 per cent. methyl alcohol to remove the acid, and in most cases preserved in spirit of this strength till required for embedding.

Embedding.—All specimens were embedded in paraffin in the usual way, xylol being the solvent employed. The most generally useful wax was found to be that having a melting-point of 52° C., though occasionally one melting at a higher temperature was advantageous.

Cutting the sections.—In order to obtain serial sections as easily and quickly as possible a Cambridge rocking microtome was used. The most satisfactory thickness of section was found to be 10μ, and all sections figured are this thickness unless it be otherwise stated. The ribbon of sections in paraffin was allowed to spread upon warm water, while it was found necessary to ensure attachment to the slide by means of Meyer's albumen solution.

Staining the sections.—After having compared the results

obtained by the use of a number of stains, I am satisfied that hæmatoxylin counter-stained with Bismarck-brown is the best all-round combination. It is unsurpassed if the sections have to be photographed; while it is more restful to the eye when a large series of sections have to be examined than are most colours. I have also used hæmatoxylin along with saffranin and obtained good photographs.

Photographing the sections.—In my opinion the flame of an oil lamp is preferable as a source of illumination to more powerful methods of lighting such as acetylen and incandescent gas. For the best results the condenser should be achromatised and fitted with an iris diaphragm. Strangely enough, contrary to the published experience of most workers, I have obtained better photographs without the use of an eyepiece than with one, even when using a specially constructed projection-eyepiece and making all adjustments most carefully. Backed orthochromatic plates give in most cases the best results, and when the sections have been stained with Bismarck-brown no light-filter is necessary. In every case the magnification in diameters was carefully ascertained at the time of taking the photograph.

Many workers find it difficult to obtain sufficient density in their negatives without having recourse to intensification. The best all-round developer I am aware of is one in which the reducing agent is a mixture of metol and hydroquinone in the proportion 1 : 2; the accelerator being sodium hydrate solution to which a little citric acid is added to prevent stain.

In conclusion I desire to state that I have carried out this investigation, first, as a Carnegie research scholar, later as a Carnegie research fellow, at the Royal Botanic Garden, Edinburgh. My grateful thanks are therefore due to the Carnegie Trust for the Universities of Scotland; as well as to Professor Bayley Balfour, under whose supervision I have worked, for kind assistance in many ways, and for supplying me with seed of many plants, some of considerable rarity.

I. THE GENUS ASPARAGUS.

With the exception of *Asparagus medeoloides*, Thunb.—merely mentioned by Klebs (4) in a list of those monocotyledons having a type of germination which he terms " type 1 "—the only member of this genus whose embryo and seedling have been even superficially described appears to be *A. officinalis*, Linn. This is the

more surprising since, as far back as 1809, Mirbel (1) published a wonderfully accurate account of the external features of the seedling in the latter plant ; while the extreme leaf reduction and other characteristics of the numerous species might have been expected to stimulate further investigation.

I have examined six *Asparagi* other than *A. officinalis*, namely, *A. comorensis* ; * *A. medeoloides*, Thunb. ; *A. plumosus*, Baker ; *A. trichophyllus*, Bunge ; *A. tenuifolius*, Lam. ; and a species, the seed of which was supplied to me as that of *A. rugulosus*, a name I have been quite unable to trace. The germination in all of these is remarkably similar, differing only in the number of kataphylls—each with a single axillary rhizome bud—which remain within the sheath of the cotyledon. The plants examined can in this respect be separated into two groups, those of the first having at the base of their primary axis one, those of the second two of these large underground buds which, when they grow, produce a part of the sympodial rhizome before forming epigeous stems. Since the retention of one kataphyll within the cotyledon sheath is characteristic of all species, and since the retention of two instead of one must be regarded only as a further specialisation along the same lines, it is no distortion of the facts to state that the various species of the genus show as close a correspondence in the features of their germination as they do in the anatomy of their mature organs.

In studying any plant-embryo and following out the changes which take place in it as it escapes from the seed and establishes its independence, it is essential that the main structural peculiarities of adult specimens be borne in mind, if the facts under observation are to be easily or thoroughly appreciated. For this reason the chief characteristics of the full-grown vegetative parts in the genus *Asparagus* may be briefly stated here, before passing on to describe in detail the type of embryo and germination which I wish also to associate with it. Of these there are two, both very strongly marked and equally worthy of mention : first, the perennation by means of a sympodial rhizome and fleshy storage-roots lying at some depth in the soil ; second, the reduction of the leaves to mere scales—or in part to thorns in the case of certain scrambling species such as *A. Sprengeri*, Regel—and their replacement by cladodes (Plate LIV, Fig. 16), sometimes remarkably leaf-like as in *A. medeoloides* (C, Fig. 3). The usual presence of long, stout, almost unbranched pull-roots, though less important, should not be lost sight of.

* Though known to horticulturists for a number of years, this plant does not seem to have been specifically described, and I have been unable to discover how or when it received the name *A. comorensis*. Though, according to the Index Kewensis, it may be synonymous with *A. crispus*, Lam., it is certainly not, as has been thought, a form of *A. plumosus*, Baker. This is clear from the fact that its primary axis has only one basal kataphyll, while that of the latter species has always two.

The Embryo.

The typical *Asparagus* fruit is a berry containing a small and variable number of seeds. These are fairly large, quite close together, and when ripe are often more or less flattened on two sides owing to the pressure they exert upon each other during their development ; when they escape crushing, however, they are almost spherical. On the thin, dark-coloured seed-coat there can, as a rule, be distinguished the hilum—a flat roughish area ; and the micropyle, which has the appearance of a small dome-shaped protuberance. If the seed be carefully sliced open in a plane traversing both hilum and micropyle, a section will be obtained passing longitudinally through or by the side of the embryo, easily seen lying in the semi-transparent endosperm which is of extreme hardness, probably that it may resist the digestive processes of birds which feed upon the berries.

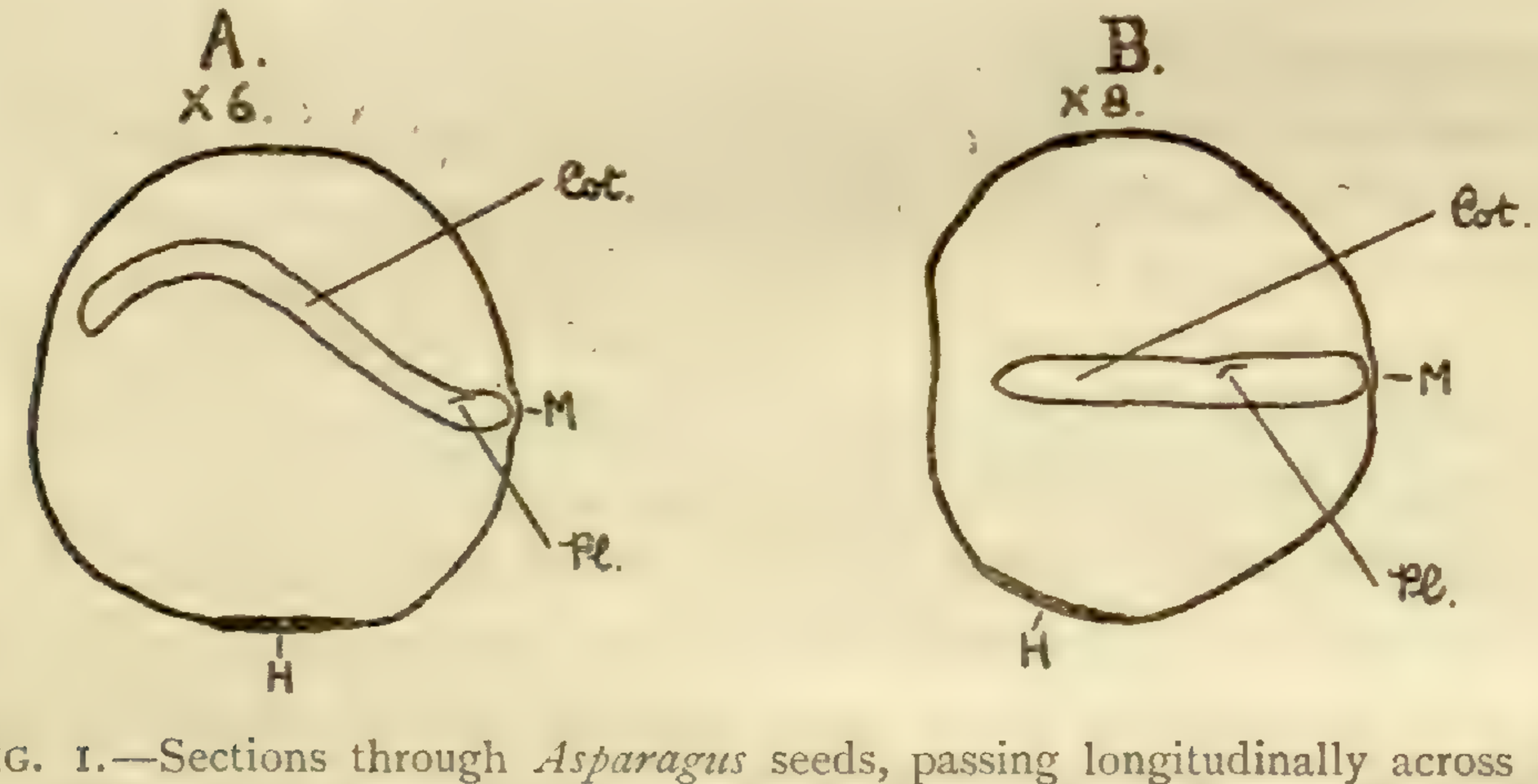

FIG. 1.—Sections through *Asparagus* seeds, passing longitudinally across the embryo. A, *Asparagus comorensis* ; B, *A. medeoloides* Thunb. ; M., micropyle ; H., hilum ; Pl., plumule ; Cot., cotyledon.

The embryo may be straight as in *A. medeoloides* (B, Fig. 1) and *A. officinalis* ; or somewhat curved as in *A. rugulosus* and *A. comorensis* (A, Fig. 1). It is long and narrow, reaching from the micropyle, against the dome-shaped covering of which its radicle is pressed, almost to the opposite side of the seed. In longitudinal section the extremity of the radicle shows all the structure of a normal root-apex, very well developed as compared with many other embryos (Plate LIII, Fig. 4). At a distance above this, varying in different species from $\frac{1}{9}$th (in *A. rugulosus*) to $\frac{1}{3}$rd (in *A. medeoloides*) of the total length of the embryo, is situated the plumular meristem, a laterally placed, rather slanting patch of tissue showing no differentiation into axis and leaf (Plate LIII, Figs. 8, 9). The remainder of the embryo forms the cotyledon (Plate LIII, Figs. 1 and 5), whose lower sheathing portion completely enfolds the plumule ; the minute slit through which the shoot will emerge on germination being discernible, though not without

difficulty, at its base (Plate LIII, Figs. 2 and 7). So far as my investigations have gone, the vascular system of the embryo (Fig. 2) seems very variable in certain respects, not only in different, but also to a less degree in the same, species. Scholz (5B), referring to *A. officinalis*, mentions that three vascular-bundles traverse the cotyledon ; while Miss Sargant (7) has observed in *A. officinalis* and *A. decumbens* an increase in the number of xylem strands in the hypocotyl. This is due, she states, to plumular traces which in these cases are similar to, and behave in the same way as, the cotyledonary ones during the transition to the root. In the cotyledons of those *Asparagi* which I have examined three

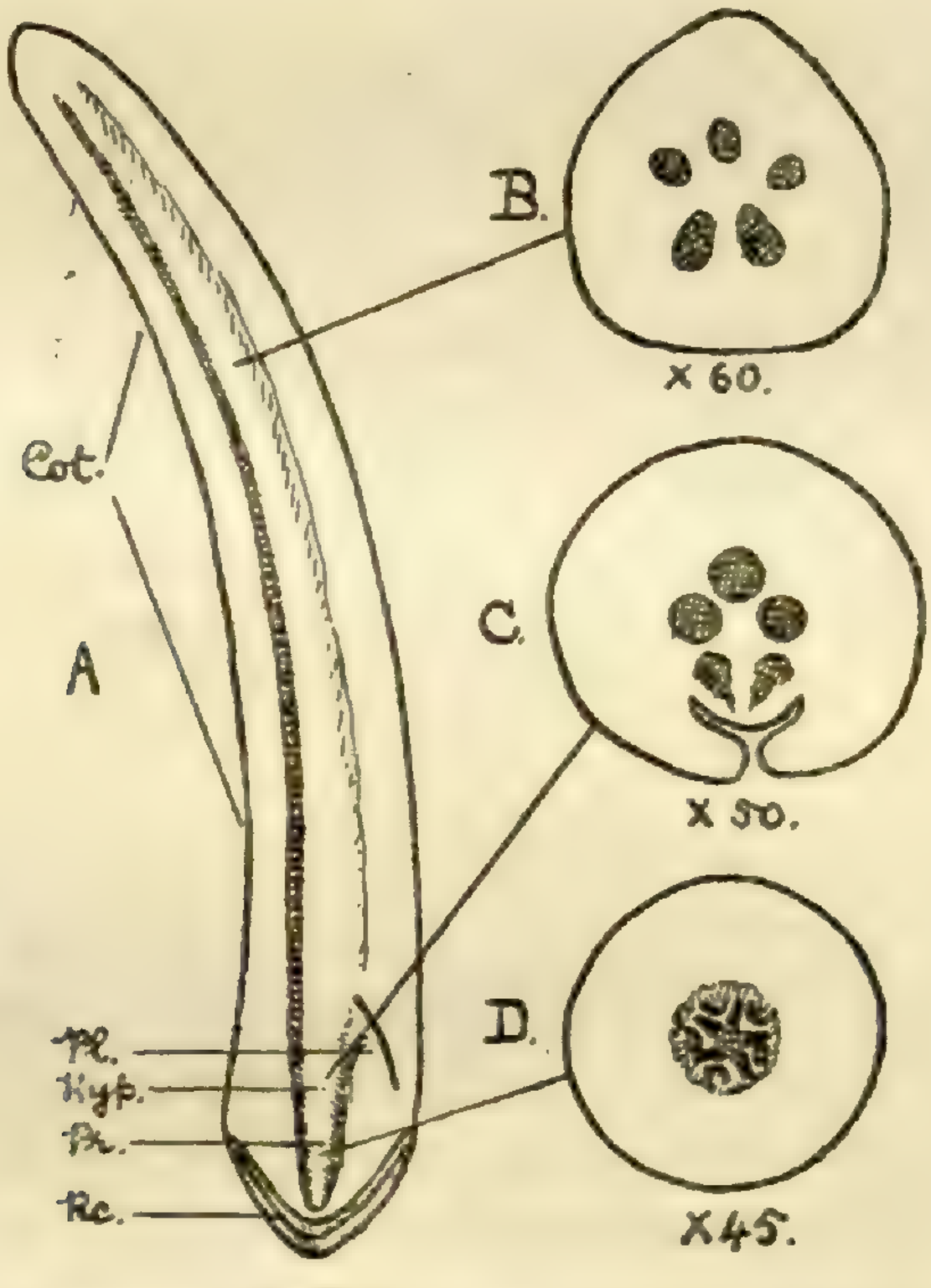

FIG. 2.—*Asparagus rugulosus*. A, Radial longitudinal section of the embryo, through the plumule. B, C, D, Transverse sections of the same through the regions indicated. In the specimen illustrated the cotyledonary xylems were not augmented on passing into the root-stele. Cot., cotyledon ; Hyp., hypocotyl ; Pl., plumule ; Pr., primary root ; Rc., root-cap.

bundles occurred only in two—*A. plumosus* and *A. trichophyllus* (Plate LIII, Fig. 1)—though not constantly in the latter plant, four being also met with. In *A. rugulosus* (Fig. 2) the number was usually four, occasionally five as illustrated ; while in *A. medeoloides*, only a few specimens of which were cut transversely however, five bundles were observed. Counting the protoxylem patches in the central stele of the primary root, which, owing to the extreme shortness of the hypocotyl, forms nearly the whole of that portion of the embryo lying below the plumule, and comparing their number with that of the bundles in the cotyledon, it was found that in some cases this was the same, while in others

there was an increase (Plate LIII, Figs. 1 and 3). The numbers noted are arranged below in tabular form, but it would be rash to attempt to draw conclusions from so small a number of sections, and they are given chiefly to indicate that there is a lack of uniformity in this respect. It may be pointed out, however, that

Species.	Number of Bundles in the Cotyledon.	Number of Protoxylems in the Root.
A. trichophyllus, Bunge .	3 or 4	5
A. rugulosus . . .	4 or 5	4 or 5
A. medeoloides, Thunb. .	5	5 or 7
A. plumosus, Baker . .	3	7

A. plumosus and *A. medeoloides*, both of which on germination retain two rhizome buds within the cotyledon sheath, also have most protoxylems in their root-stele. This appears, moreover, to be independent of the number of bundles in the cotyledon, since *A. medeoloides* has five, but *A. plumosus* only three.

Germination.

Seed of all the species examined was sown in a moist hot-house, one portion on the surface of cocoanut fibre, another in pots of sandy soil at a depth of an inch or more. About three weeks elapsed in most cases before the commencement of germination, though under similar conditions Scholz (5B) states that seed of *A. officinalis* began growth in eight days. The discrepancy may be accounted for by the fact that this plant is hardy, while those I experimented with require in this country protection under glass. When germination commences, that part of the cotyledon situated just above the plumule begins to elongate. The radicle is thus caused to press against the dome-shaped covering of the micropyle, and since this is less thickened than the rest of the seed-coat it gives way and falls out like a little circular lid. As soon as the developing portion of the cotyledon has lengthened sufficiently to ensure that the slit at its base, through which the shoot has later to escape, is quite free, its growth ceases, with the result that the seed remains closely attached to the seedling (C, Fig. 3). By this time the radicle has begun to elongate very rapidly; it develops into a very short hypocotyl and a stout, long-lived tap-root (Plate LIII, Fig. 15). Root hairs are not produced close to its apex, so that there is always a portion at the extremity of the root, behind the root-cap, free from hairs.

This is so from the very first, and we have here a marked difference between seedlings of the genus *Asparagus* and those of many monocotylous families, such as the *Juncaceæ* and the *Cyperaceæ*. The hairs themselves are short and wonderfully persistent, densely covering the whole of the root with the exception of this apical part. The slit in the cotyledon occupies a slanting position facing upwards owing to the curving down of the short hypocotyl and the primary root towards the soil. The margins of the slit soon grow slightly, forming a somewhat leaf-like rim to the cavity which is enclosed (A, Fig. 3), and shortly afterwards the apex of the primary axis, capped by two sheathing leaves, makes its appearance from within. A little later there

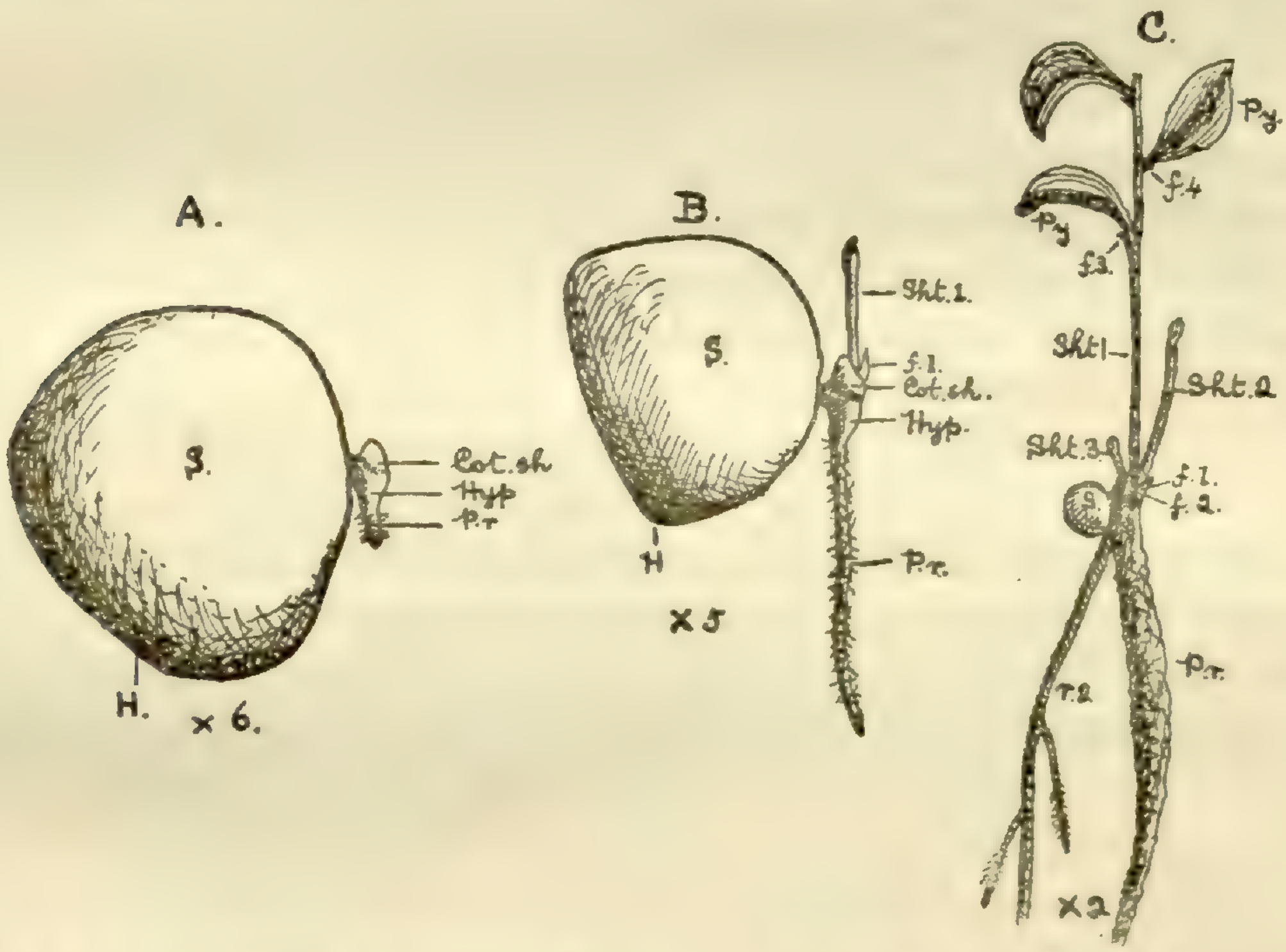

FIG. 3.—*Asparagus medeoloides*, Thunb. A, very young seedling. B, older stage. C, seedling one month old. H., hilum; S., seed; Cot.-sh., sheathing base of cotyledon; f. (1, 2, &c.), leaves of primary axis (1st, 2nd, &c.); Hyp., hypocotyl; Pr., primary root; Py., cladode; r.2, secondary root; Sht. (1, 2, &c.), axis (primary, secondary, &c.).

also emerges a second structure, at the side of the developing stem away from the cotyledon and seed. This is the first leaf of the shoot, which invariably remains below ground at its base, partially enclosed by the cotyledon (B, Fig. 3). That this may be so the epicotyl is never elongated, even when the seeds are germinated at a depth of an inch or more below ground; in such a case one or two internodes of the basal portion of the axis become longer than usual in order to reach the surface. In two of the species examined, namely, *A. medeoloides* and *A. plumosus*, the second leaf of the shoot is also habitually retained by the side of the first, through the suppression of both the epicotyl and the internode immediately above it. These hypogeous leaves

are always sheathing kataphylls ; though when two are present the second is much smaller than the first and does not protrude beyond the sheath of the cotyledon (Plate LIII, Fig. 14). In the axil of each kataphyll there is early formed a large bud which grows into the secondary stem, and this in turn produces below ground two contracted internodes bearing two sheathing kataphylls, one or both of which subtend a single axillary bud, the process being repeated indefinitely. Even in those species retaining only one kataphyll below ground at the base of their primary axis—that derived from the plumular meristem directly —there are two in the case of the secondary one and all that follow, though as a rule only the second of these has in its axil a bud. In this way the sympodial rhizome so characteristic of the genus is built up from the bases of the aerial shoots.

Let us now examine the changes which have taken place in the other parts of a somewhat advanced seedling. The suctorial end of the cotyledon (Plate LIII, Figs. 1 and 5) gradually enlarges within the seed as the reserve food-material of the endosperm becomes dissolved and absorbed. This is a slow process however, and the seed remains attached to the plant for a considerable period. The primary root in seedlings three or four weeks old has become more or less thickened—especially so in *A. medeoloides* (C, Fig. 3), many of the roots of which function solely as storage organs—and seems to act largely as a pull-root. It never branches, becomes wrinkled, and in fact presents all the peculiarities typical of such roots. Soon there arises, usually from the point where the hypocotyl and stem meet, a lateral root which branches and remains unthickened (C, Fig. 3). This is followed by other lateral roots proceeding from the rhizome as it is formed—for it must be remembered that two or more joints of this are produced each year—some of which develop in the same way as the primary root. The hypocotyl (Plate LIII, Fig. 15) remains short during the whole of its life, and, as I have already said, I have never, under any circumstances, seen one which had elongated. The stem apex in older seedlings is always protected by two or more scale-leaves, which later on are left behind, but not until others have been produced to take their place. At first they appear opposite in pairs ; then, as the internodes lengthen, they assume their true position, alternating in a $\frac{1}{2}$ spiral. The first few scale-leaves of the stem—not including the basal kataphylls—sometimes have apparently no axillary buds, for example *A. comorensis* (Plate LIV, Fig. 16) ; but in other cases, such as *A. medeoloides*, may subtend lateral aerial branches or even cladodes (C, Fig. 3). In a longitudinal section of the stem apex in the latter plant (Plate LIII, Fig. 6) it is interesting to note how the development of the large leaf-like cladodes is almost as rapid as that of the

leaves in whose axils they arise ; while the vascular traces run out not into the leaves but into the cladodes.

There yet remains to be mentioned a matter of some interest and no little importance. Owing to the increasing girth of the seedling the sheathing base of the cotyledon becomes pushed to one side of the lower extremity of the stem ; while opposite it, and at the same level, arise the one or two kataphylls, now no longer enfolded by it (C, Fig. 3). *A. officinalis*, the only species previously described, has only one of these, and Henslow (8) and others have thought that it represented a second cotyledon, delayed in development and reduced in size. Following out this idea still further, it has been suggested that monocotyledons have been derived from a dictotylous ancestor by the suppression of one of the cotyledons. A more detailed account of the changes which take place in the plumular meristem during germination will be necessary before discussing this question. I may say, however, that while it seems quite likely that the ancestor of all present-day angiosperms was a dicotylous type, the above attempt to prove this will not stand examination.

The Development of the Plumular Meristem.

After the examination of a large number of monocotylous embryos I have found that, knowing the relative development of stem and leaf in the mature plant, one can guess with fair accuracy what the structure of the embryonic plumule will be. In other words, I believe that the characteristics of the adult produced in response to its environment, have tended to appear ever earlier in the life-history of the individual, till now they are found impressed even on the embryo, shut up though it be within the seed. Moreover, I am inclined for this reason to doubt the utility of searching for evidence regarding a plant's phylogeny in this region at least of its embryo. Applying what has been said to the genus *Asparagus*, let us consider what might be expected in the plumular meristem, and then observe how this agrees with its actual structure, as described later on. We are dealing with plants whose leaves are reduced to mere scales, while very much specialised branches function in their stead ; the stem has in fact become dominant over the leaf. It would therefore be natural to infer that the formation of leaf-primordia might possibly not yet have taken place in the embryo, and that in its subsequent growth the greater part of the plumule would be devoted to the formation of axis.

Though in the case of many monocotyledons the plumule of an embryo taken from a ripe seed will be found to consist of one or more leaf rudiments arising from an axial part, in the

genus *Asparagus* it is quite undifferentiated. It would be incorrect to apply the term " bud " to the simple dome-shaped meristematic patch which here constitutes this region. It is laterally placed near the lower end of the embryo, and slants downwards and outwards so that it may almost be said to face the slit in the base of the cotyledon through which the structures derived from it are later on to find an exit (Plate LIII, Figs. 8 and 9). On the commencement of germination there is developed from a portion of its outer and lower margin, constituting less than a quarter of the entire meristem, a small swelling, which grows slowly larger and finally forms the first leaf of the primary axis (Plate LIII, Figs. 9–11). As previously mentioned, this is a kataphyll, and remains permanently in the position in which it comes into existence, directly opposite the cotyledon ; while very soon a

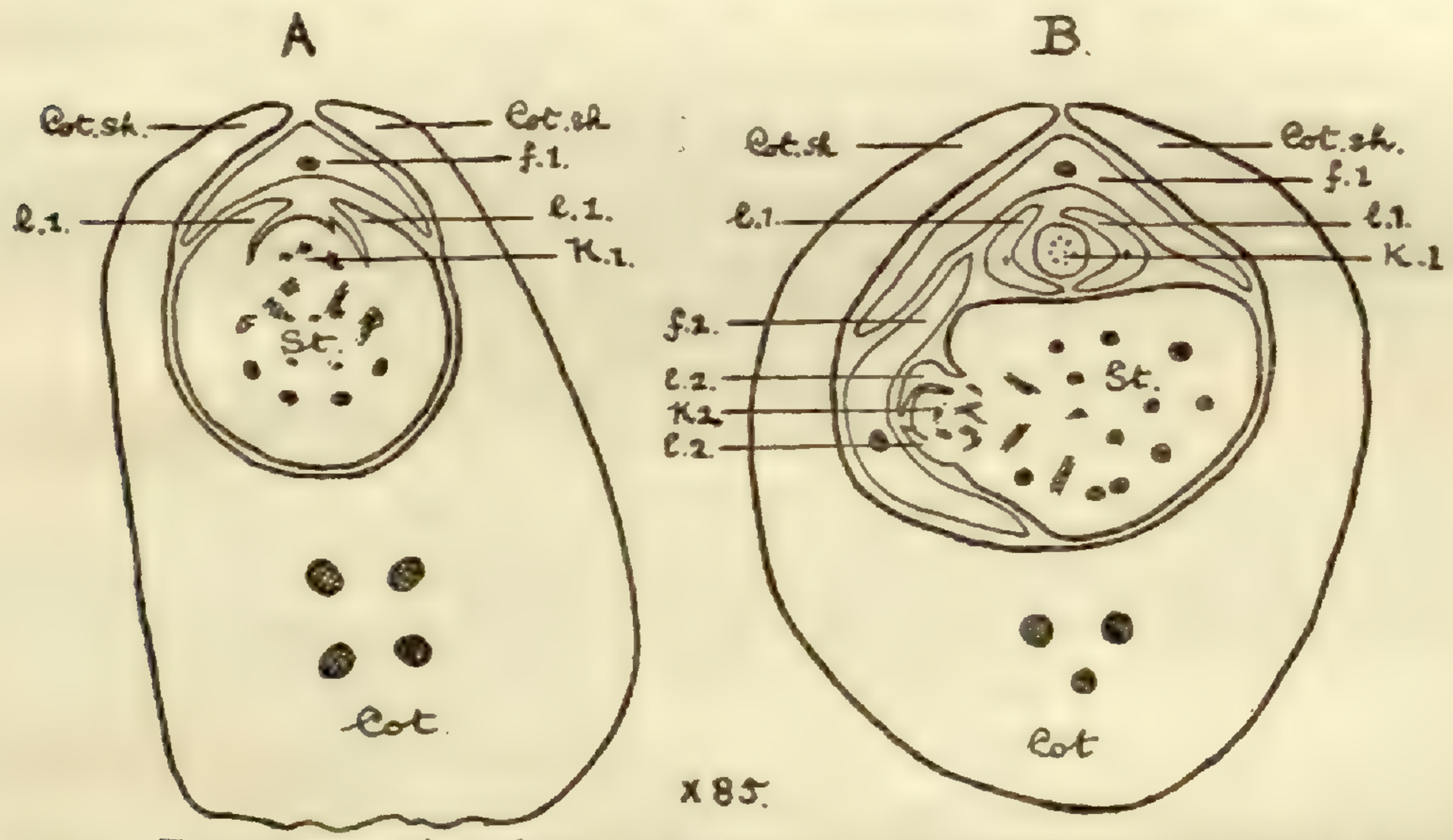

FIG. 4.—Transverse sections through the base of the primary axis in *Asparagi*, having respectively one and two basal kataphylls. A, *A. rugulosus*. B, *A. plumosus*, Baker. Cot., cotyledon ; Cot.-sh., sheathing base of cotyledon ; f. (1, 2), kataphyll (1st, 2nd) ; k. (1, 2), rhizome-bud (of 1st, 2nd kataphyll) ; l. (1, 2), leaf of 1st, 2nd rhizome bud ; St., primary axis.

remarkably large rhizome bud is produced in its axil (Plate LIII, Fig. 12). This bud takes part in the construction of the main underground sympodial rhizome. In those species which have two kataphylls at the base of the primary stem, the second of these arises in precisely the same way as the first, and almost simultaneously. It is, however, always smaller than the latter in the two species in which I have observed it ; especially so in *A. medeoloides*, where it might easily be mistaken for a leaf belonging to the large rhizome bud which it also subtends, were it not for the evidence afforded by its position and earlier origin than the bud which appears to bear it (Plate LIII, Fig. 14). This second kataphyll is placed at right angles to the plane in which both the cotyledon and the first kataphyll lie, as shown in the accompanying outline drawing (Fig. 4).

The remainder of the plumule grows upwards and forms the first epigeous axis, upon which there soon appear the scale-leaves characteristic of such shoots (Plate LIII, Figs. 12 and 13). These scale-leaves arise close to the apex, two or more being always present as a protecting cap upon it (Plate LIII, Fig. 6). At first they appear almost opposite, but as the stem elongates they become separated by relatively long internodes, and assume their normal position in $\frac{1}{2}$ spiral. They differ from the basal kataphylls in not being amplexicaul and in having much smaller axillary buds which often remain undeveloped in the lower part of the shoot, but in the upper produce lateral branches bearing cladodes, or even cladodes directly, but never shoots resembling the parent axis (Plate LIV, Fig. 16).

The opinion of certain writers already alluded to, that the single sheathing kataphyll, which had been observed in advanced seedlings of *A. officinalis*, should be regarded as a second cotyledon because it arose at the base of the primary axis immediately opposite and at the same level as the cotyledon, falls to the ground for two reasons. Firstly, as has been shown, it is only after the commencement of germination that the development of this leaf takes place ; there is absolutely no trace of it before that time. It cannot, to my mind, be regarded as the homologue of an organ belonging essentially to the embryonic phase of the plant's life, especially when what has been already stated regarding the influence of adult structure upon the state of differentiation of the plumule before germination is recalled. Secondly, since we now know that some *Asparagi* have two quite similar kataphylls occupying side by side the same position as the single one of *A. officinalis* does ; and since there is no difference whatever in their mode of origin and subsequent behaviour, we must give up the claims of both, or be prepared to gift certain species with no less than three cotyledons.

Some even of the earliest investigators, such as Mirbel (1) and Braun (2), seem to have thought that the study of Asparagus seedlings helped to settle that vexed question, the homology of the cotyledon. If the secondary and all subsequent axes bore two sheathing basal scale-leaves, while the primary one—at the base of which is attached the cotyledon—had but one, did not this go to support the view that the cotyledon was the first leaf of the stem below which it arose ? It would thus correspond to the first of the pair of leaves of the succeeding axes, and could be called quite correctly a "seed-leaf." This idea is of course no longer tenable when it is known that in such species as *A. plumosus* and *A. medeoloides* the shoot derived from the plumule, as well as those which follow possess a similar pair of these kataphylls.

The Genera Ruscus, Danae, Semele.

The development of the embryo being so characteristic, and the features of germination so constant in the six species of *Asparagus* studied, it was decided to make an examination of those genera—*Ruscus*, *Danae*, and *Semele*—which in Engler's "Pflanzen-familien" are placed, along with *Asparagus*, in the sub-division *Asparageæ* of the family *Liliaceæ*. Like the latter genus they are characterised by the reduction of the leaves to minute colourless scales, by the presence of remarkable cladodes, and

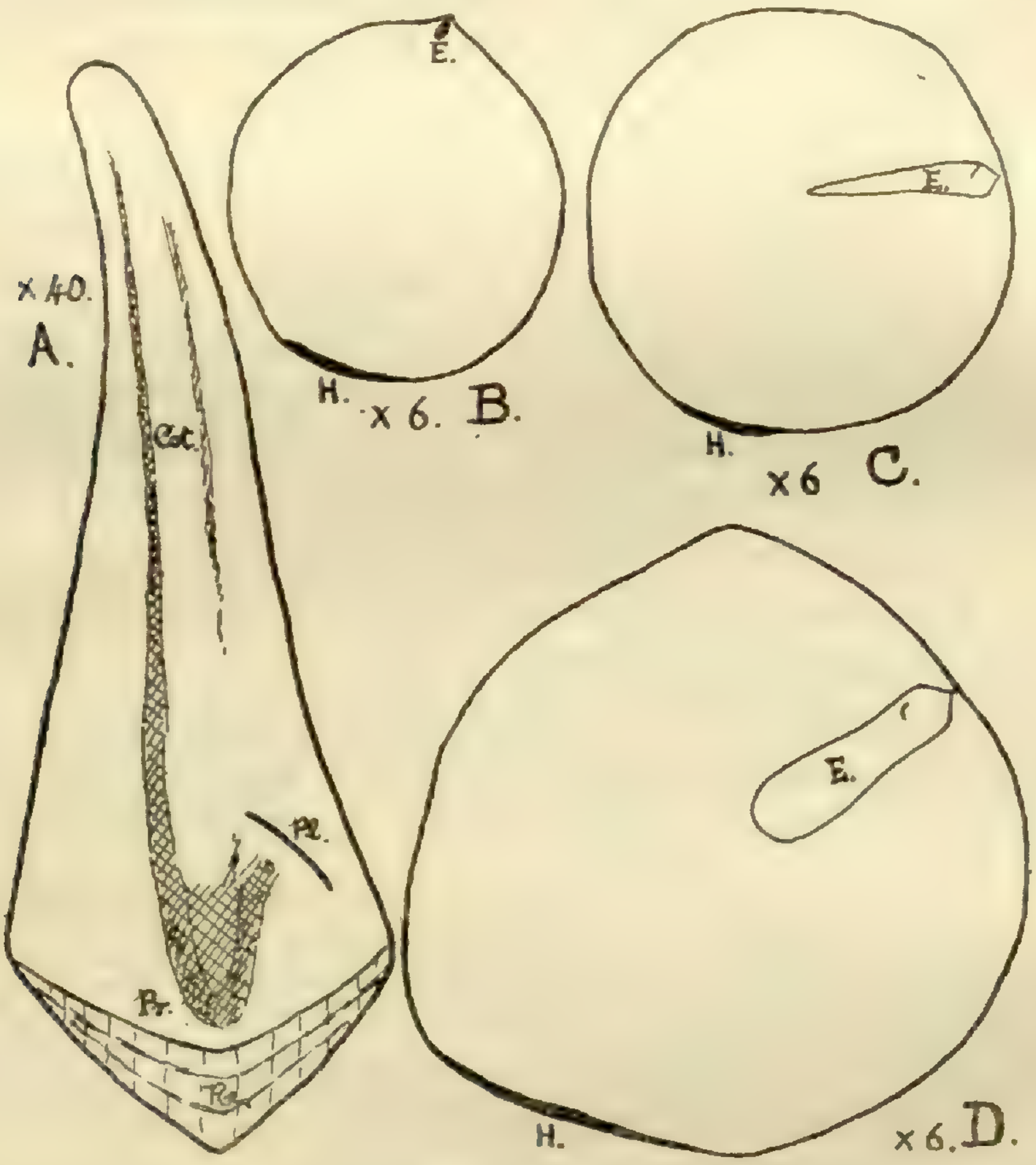

Fig. 5.—A, Longitudinal section passing through the plumule of an embryo of *Ruscus aculeatus*, Linn. B, Section of seed of *Smilax herbacea*, Linn., passing through the embryo. C, Similar section of *Ruscus aculeatus* seed. D, The same of *Danae Laurus*, Medic. Cot., cotyledon; E., embryo; H., hilum; Pl., plumule; Pr., primary root; Rc., root-cap.

by the possession of a hypogeous sympodial rhizome. One would thus expect to find little or no difference between the anatomy of their embryos and young seedlings and those of *Asparagus*. There are, however, certain modifications in structure observable which are worthy of note, and I shall chiefly confine myself here to a short account of these. Through the kindness of Professor Bayley Balfour I obtained good seed of the following plants:—*Ruscus aculeatus*, Linn.; *R. Hypophyllum*, Linn.; *Danae Laurus*, Medic.; and *Semele androgyna*, Kunth. These were germinated, sectioned, and

examined in the same way as was done in the case of *Asparagus*.

The fruit and seed in these genera are like those of *Asparagus*, except that the seed-coat is commonly of a paler colour. Both micropyle and hilum are visible ; they occupy the same positions and have the same appearance as in that genus. The embryo is shorter and broader (A, Fig. 5) but its orientation is quite similar (C, D, Fig. 5). Its various parts, including the plumule (Plate LIV, Figs. 19 and 24), closely resemble those of *Asparagus*, only that the number of vascular bundles in the cotyledon is greater (Plate LIV, Fig. 17), while the tissues of the primary root are perhaps slightly less clearly differentiated (Plate LIV, Fig. 18).

In all three genera the features of germination are remarkably alike, so much so that it will be unnecessary to fully describe and illustrate more than one ; for this purpose *Ruscus aculeatus* has been chosen. Observed from the exterior, the only differ-

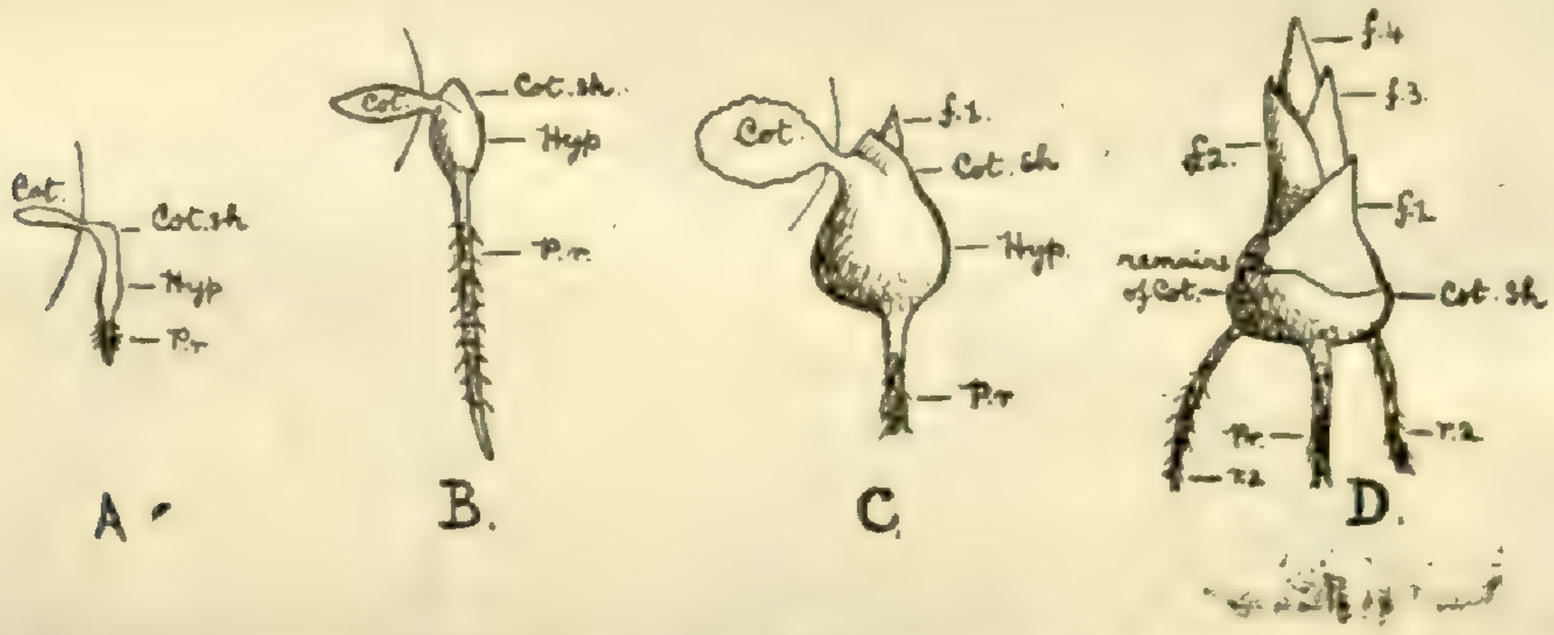

FIG. 6.—*Polygonatum latifolium*, Desf. Seedlings at various stages of development, showing the growth of the tuberous hypocotyl, &c. (All × 3.) Cot., cotyledon ; Cot. sh., sheathing base of cotyledon ; f. (1, 2, &c.), kataphyll (1st, 2nd, &c.) ; Hyp., hypocotyl ; Pr., primary root ; r. 2, secondary root.

ence is that the primary axis does not make its appearance first as in *Asparagus*, but is preceded by several kataphylls which cover it over, and have much of the appearance shown in the case of the genus *Polygonatum* (D, Fig. 6) ; later on it rapidly elongates, leaving these leaves below-ground at its base. I have not followed the growth of seedlings to maturity and so cannot say exactly how many of these basal kataphylls—separated only by short internodes—are normally produced, but I have before me a section of *Semele androgyna* in which no less than eight are shown, each with a very large axillary bud. In *Ruscus* a smaller number seems to be typical, and the first apparently subtends no bud ; while here, as in the other two genera, both the epicotyl and the internodes between the kataphylls elongate a little, especially in deep-sown seedlings (Plate LIV, Fig. 23). In longitudinal sections of the young seedling it is seen that the greater part of the plumular meristem is devoted to the formation of leaves, and that these sheath the axis more completely than in

Asparagus. The sheathing bases may be relatively large as in *Ruscus* (Plate LIV, Fig. 21), or smaller as in *Semele* (Plate LIV, Fig. 25); but they are only produced when the leaf has become well developed, being represented before then by a narrow band of meristematic tissue passing round the axis outside and at the base of the succeeding leaf, and distinguishable from a leaf-primordium by the absence of the well-marked vascular bundle which passes out into the latter (Plate LIV, Fig. 22). With these exceptions, the rest of the *Asparageæ* differ but little from the genus *Asparagus*.

The Genus Polygonatum.

I have included a few drawings of *Polygonatum latifolium,* Desf., to illustrate an interesting modification in the development of the seedling, which I think further investigation will prove common to the genus. The structure of the seed and embryo is similar to that of *Asparagus medeoloides*

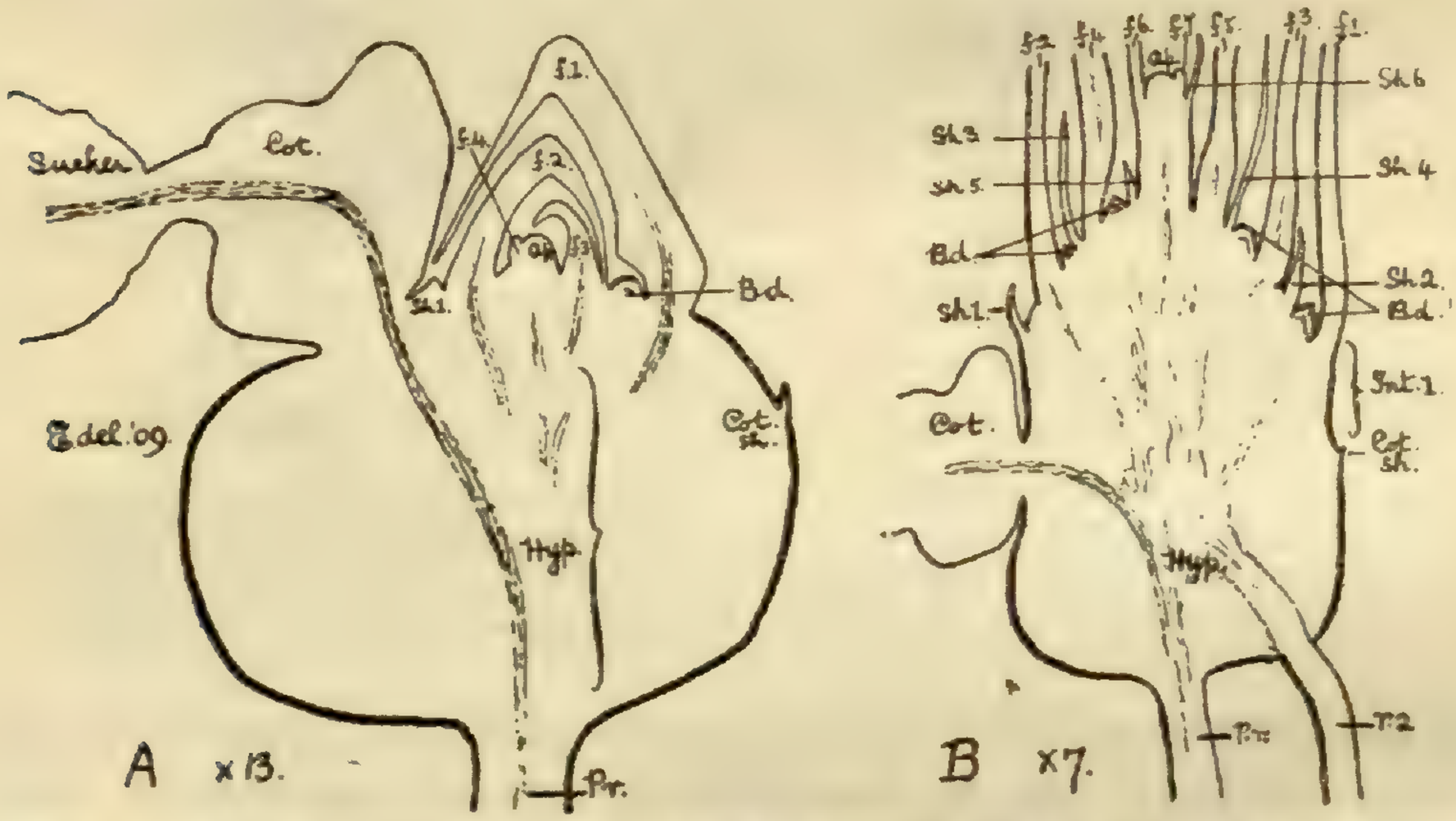

FIG. 7.—*Polygonatum latifolum*, Desf. Longitudinal sections of seedlings through the plumular region. A, a young; B, an advanced seedling. Cot., cotyledon; Cot. sh., sheathing base of cotyledon; Ap., shoot apex; Bd., rhizome buds in the axils of the kataphylls; f. (1, 2, &c.), kataphyll (1st, 2nd, &c.); Hyp., hypocotyl; Pr., primary root; r.2, secondary root; sh. (1, 2, &c.), sheathing base of leaf (1st, 2nd, &c.); Int. (1), internode (1st).

(B, Fig. 1), while the general characteristics of germination are very like those found in *Ruscus, Danae,* and *Semele.* The interesting point, however, is that the hypocotyl—which in these plants remains almost undeveloped—becomes in this case enlarged into a tuberous structure, and thus helps in the formation of the first joint of the thick, fleshy, sympodial rhizome typical of the genus *Polygonatum* (Fig. 6). The growth of the plumule resembles that of *Ruscus,* but the epicotylar and few succeeding internodes are rather more elongated and fleshy; while the kataphylls are

a little more prominent. Some five of these leaves are produced upon this shortened underground part of the primary axis, which then elongates to form an aerial shoot, leaving them at its base (Fig. 7). In the axil of each lies a large bud; that of the fifth continues the growth of the main rhizome, while those of the preceding four—if they develop further—give rise to its lateral branches.

The Genus Smilax.

Two species of *Smilax* were examined—*S. herbacea*, Linn., and a plant of uncertain identity. In these the seed and its germination were indistinguishable, exhibiting the following peculiarities as compared with *Asparagus*. The micropylar region of the seed forms a small protruding point, in which

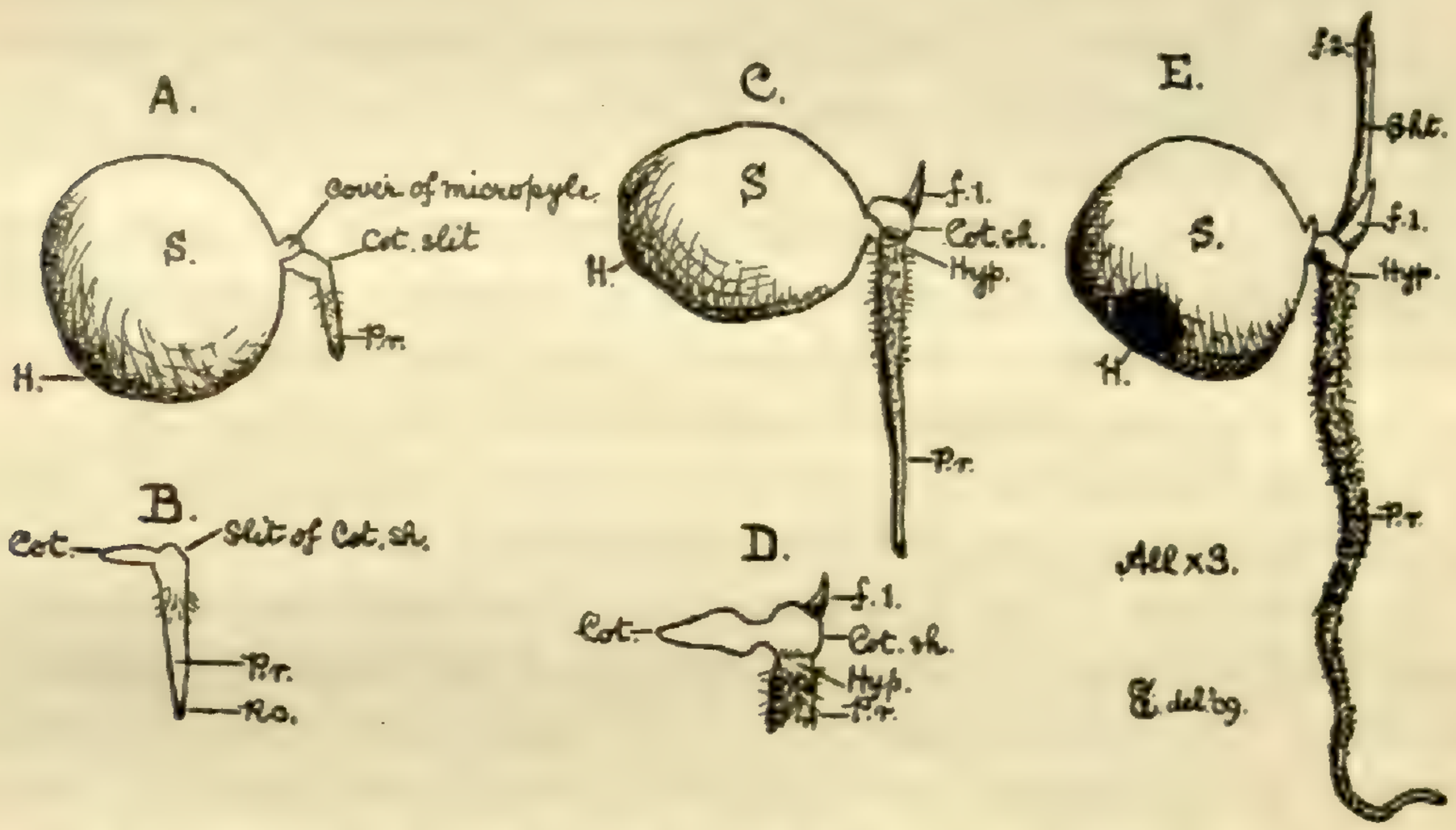

Fig. 8.—*Smilax*, Sp. Seedlings in various stages. Cot., cotyledon; Cot. sh., sheathing base of cotyledon; f. (1, 2), leaf of primary axis (1st, 2nd); H., hilum; Hyp., hypocotyl; Pr., primary root; S., seed; Sht., primary axis; Rc., root-cap.

lies the extremely small embryo (B, Fig. 5). I have been unable to detect any differentiation in these embryos, several of which have been cut and examined, though this may be due to the difficulty of correctly orientating so small a structure when embedding it. I am, however, inclined to believe that, even in "ripe" seed, the embryo is at a very early stage in its development, and remains so during its resting period within the seed. The cotyledon of quite young seedlings is so very much larger than that region of the minute embryo that I think it probable that between sowing and actual germination—as this term is usually applied—the embryo undergoes further growth, as has been observed in the case of *Juncus* and other plants.

It will be seen that the appearance of seedlings at various stages (Fig. 8) at once recalls the genus *Asparagus*. As one

would expect in plants, such as *Smilax*, with large leaves and long climbing stems, both are well represented in the plumule of a young seedling (Plate LIV, Fig. 26). The first leaf—a kataphyll—is rapidly developed and appears from the sheath of the cotyledon before the primary axis (C, Fig. 8), which soon follows (E, Fig. 8). This is the only basal scale-leaf produced, and subtends a very large rhizome bud exactly like that of *Asparagus* (Plate LIV, Fig. 27). Moreover, both the hypocotyl and the epicotyl remain, as in that genus, quite unelongated.

Summary.

Asparagus (p. 4).

1. The embryo is long and narrow, straight or somewhat curved, and consists of a long cotyledon, a plumule, and a well-differentiated radicle (p. 6).

2. The plumule lies near the root-pole, and is quite undifferentiated into leaf-primordia and axial portion. It consists of a dome-shaped patch of meristematic tissue, and occupies a lateral position, slanting downwards and outwards (pp. 6 and 12).

3. The vascular system of the embryo seems variable, both in different species and different individuals (p. 7).

4. The type of germination found throughout the genus is remarkably constant. It is characterised by the stout persistent tap-root; by the dominance of the axis; by the failure to elongate of hypocotyl, epicotyl, and sometimes even the internode above the latter; and by the presence of hypogeous kataphylls at the bases of the shoots, in whose axils large rhizome buds arise (p. 8).

5. The mass of the plumular meristem gives rise to axis, the basal kataphylls being derived from a small portion at its outer margin (p. 11).

6. Each kataphyll subtends a single rhizome bud (pp. 10 and 12).

7. The species examined can be divided into two groups—those having at the base of their primary axis one, and those having two kataphylls (pp. 5, 9, and 12).

8. The apex of the shoot is always protected by two or more scale-leaves. In its upper part the cladodes arising in the axils of the leaves develop almost as rapidly as the leaves themselves (pp. 10 and 13).

9. The elongation and branching of the sympodial rhizome is brought about by the rhizome buds (p. 10).

10. The primary root acts as a pull-root, and sometimes as a storage-root (p. 10).

11. The statement that the first kataphyll represents a second cotyledon is disproved by the fact that it only makes its appearance after germination, and that some species have two (p. 13).

12. For the second of the above reasons it also follows that the anatomy of *Asparagus* seedlings does not support the view that the cotyledon is a leaf (p. 13).

Ruscus, Danae, and *Semele* (p. 14).

13. The embryo is shorter and broader but in all other respects resembles that of *Asparagus* (p. 15).

14. The germination is almost identical in all three genera, and differs from that of *Asparagus* in the larger number of more sheathing basal kataphylls ; in the less dominant axis ; and in the slight elongation of the epicotyl and succeeding hypogeous internodes of the primary axis (p. 15).

Polygonatum (p. 16).

15. The germination much resembles that of *Ruscus* ; the most interesting deviation is the part played by the tuberous hypocotyl in the formation of the fleshy rhizome (p. 16).

Smilax (p. 17).

16. In ripe seed the embryo is very minute and apparently undifferentiated (p. 17).

17. The germination very closely resembles that of *Asparagus* ; axis and leaf are, however, about equally developed (p. 17).

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EXPLANATION OF PLATES, LIII AND LIV.

Illustrating W. Edgar Evans' paper "On the Further Development during Germination of Monocotylous Embryos."

EXPLANATION OF THE ABBREVIATIONS USED IN LETTERING THE FIGURES.

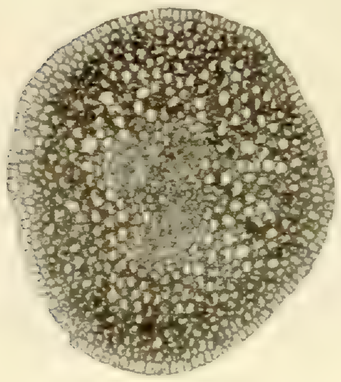
ap. =apex of primary axis.
cot. =cotyledon.
cot. sh. =sheathing base of cotyledon.
der. =dermatogen.
f. (1, 2, &c.)=leaf of primary axis (1st, 2nd, &c.).
hyp. =hypocotyl.
int.(1)=internode of axis(1st)=epicotyl
l. (1)=leaf of secondary axis (1st).
per. =periblem.
pl. =plumule.
pler. =plerome.
pr. =primary root.
py. =cladode.
rc. =root-cap.
sh. (1, 2, &c.)=sheathing base of leaf of primary axis (1st, 2nd, &c.).
sht. (1, 2, &c.)=axis (primary, secondary, &c.).

Plate LIII.

FIG. 1. Transverse section through cotyledon of embryo of *Asparagus trichophyllus*, Bunge, showing three vascular bundles . . ×75
FIG. 2. Trans. sect. through plumule of embryo of *A. trichophyllus*, showing plumule and sheathing base of cotyledon . . . ×75
FIG. 3. Trans. sect. through radicle of embryo of *A. trichophyllus*, showing 5 protoxylem patches in the central stele . . . ×75
FIG. 4. Longitudinal sect. through root-apex of embryo of *A. rugulosus*, showing the tissues . . . . . ×110
FIG. 5. Long. sect. through cotyledon of embryo of *A. rugulosus* . . ×60
FIG. 6. Long. sect. through stem-apex of *A. medeoloides*. Thunb., showing scale-leaves and cladodes . . . . . ×58
FIG. 7. Exterior view of slit in base of cotyledon of embryo of *A. trichophyllus* . . . . . ×145
FIG. 8. Tangential long. sect. through plumule of embryo of *A. trichophyllus* . . . . . ×145
FIG. 9. Radial long. sect. through plumule of embryo of *A. rugulosus* . ×145
FIG. 10. Rad. long. sect. through plumule of very young seedling of *A. rugulosus*, showing appearance of the 1st kataphyll . . 145
FIG. 11. Rad. long. sect. through plumule of slightly older seedling of *A. rugulosus* . . . . . ×145
FIG. 12. Rad. long. sect. through seedling of *A. rugulosus*, showing axis, and 1st kataphyll with axillary rhizome bud . . . ×54
FIG. 13. Rad. long. sect. through seedling of *A. plumosus*, Baker, showing axis, kataphyll, and rhizome bud . . . . ×26
FIG. 14. Long. sect. through base of primary axis of *A. medeoloides* seedling, showing 1st and 2nd kataphylls and their axillary rhizome buds . . . . . ×50
FIG. 15. Rad. long. sect. through young seedling of *A. rugulosus*, showing cotyledon, plumule, hypocotyl, and primary root . . ×30

Plate LIV.

FIG. 16. Seedling plant of *A. comorensis*, showing cladodes (Py) and scale-leaves (1, 2, &c.) . . . . . ×1
FIG. 17. Long. sect. through cotyledon of seedling of *Ruscus aculeatus*, Linn., showing vascular bundles . . . . . ×30
FIG. 18. Long. sect. through radicle of embryo of *R. aculeatus*, showing the tissues . . . . . ×60



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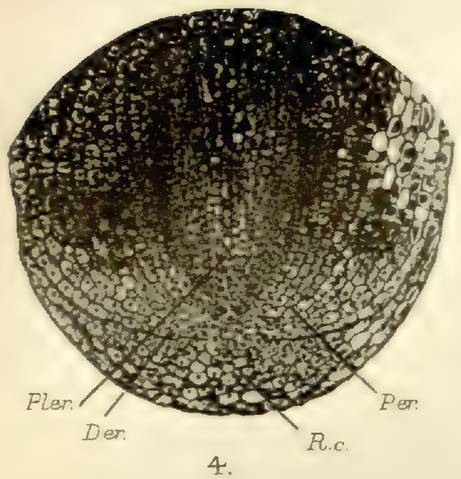

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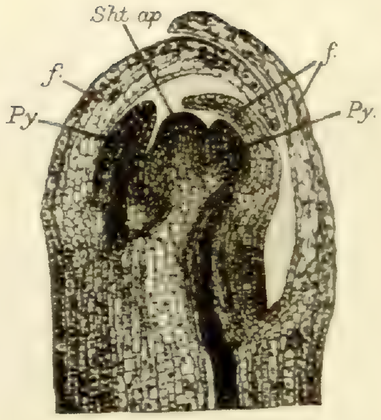

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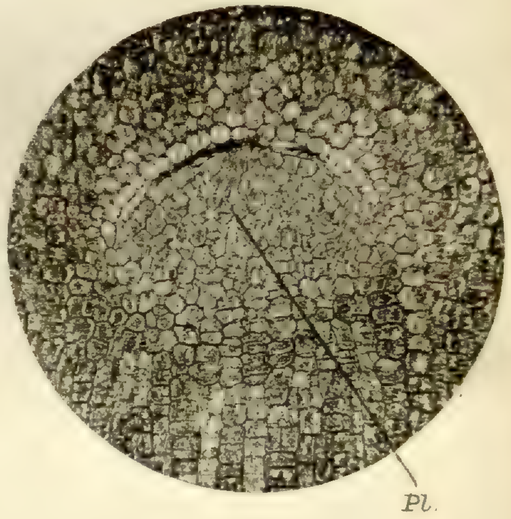

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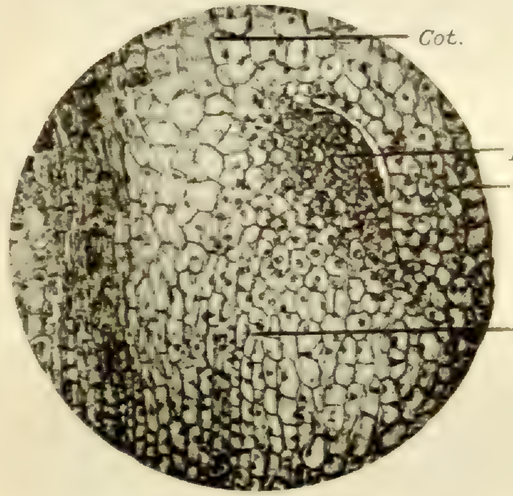

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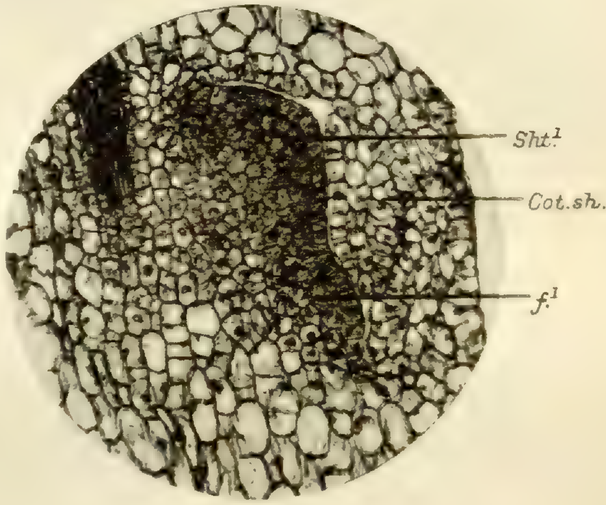

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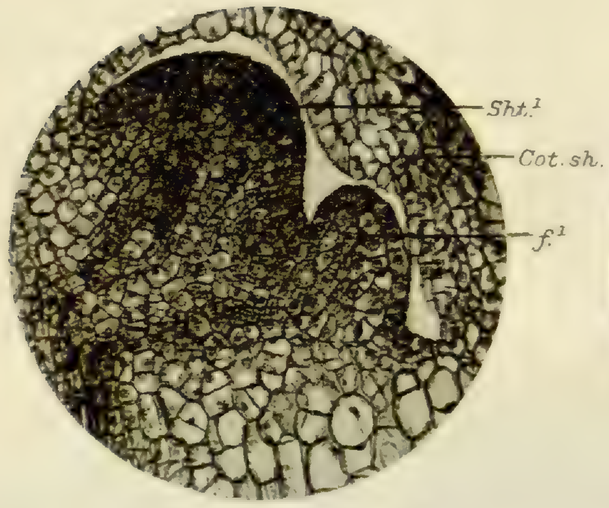

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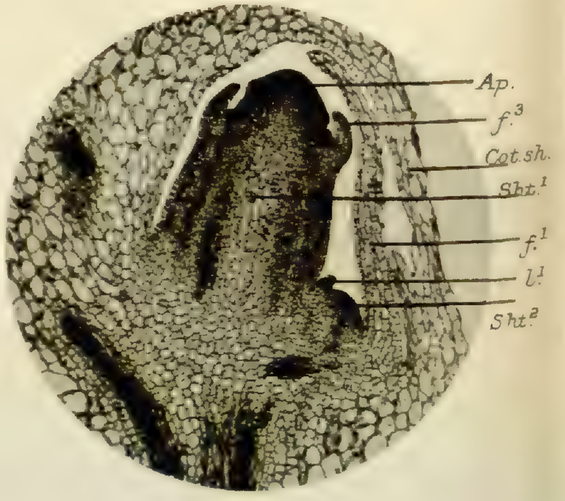

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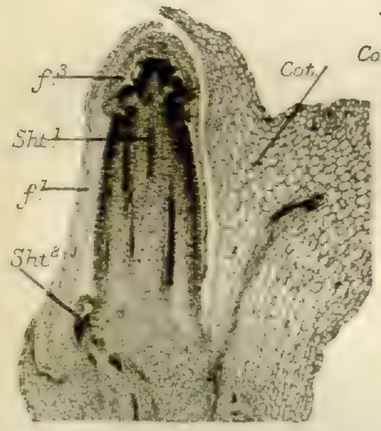

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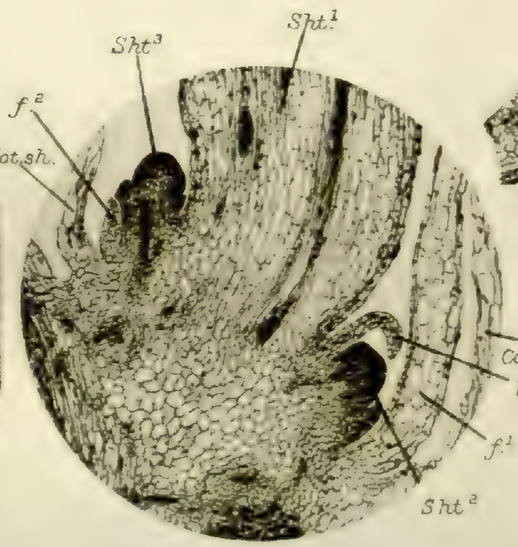

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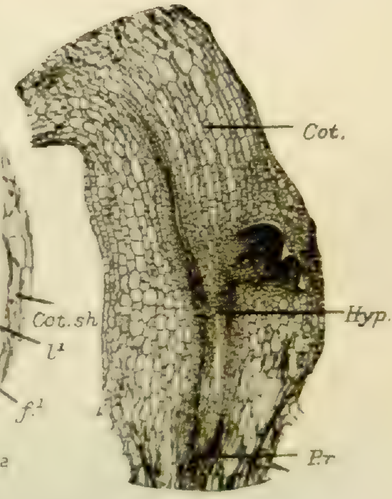

15.

W Edgar Evans, photo

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EVANS—ON THE FURTHER DEVELOPMENT DURING GERMINATION OF MONOCOTYLEDONOUS EMBRYOS.

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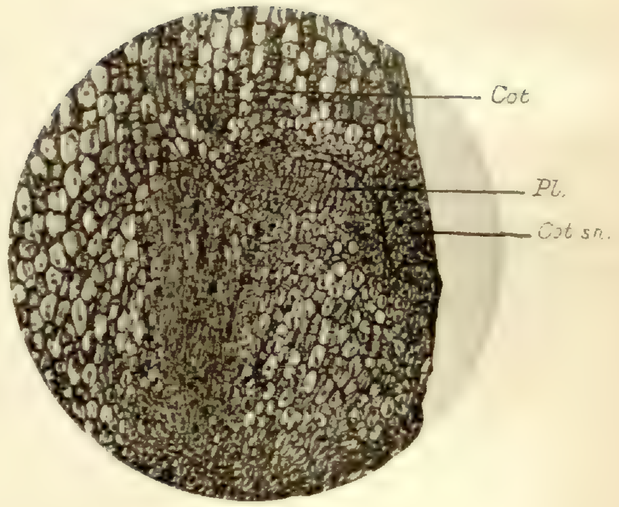

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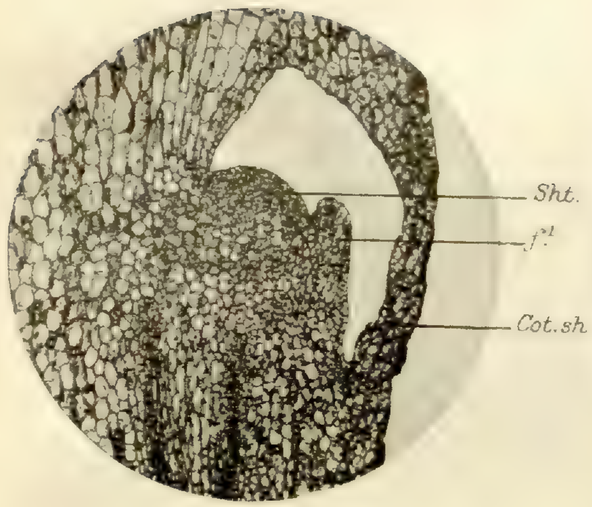

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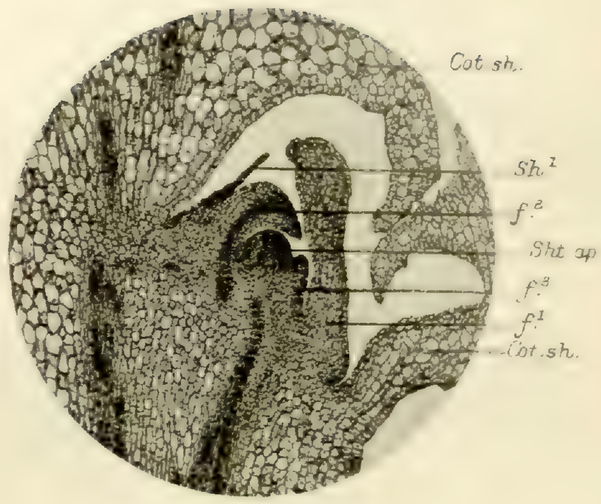

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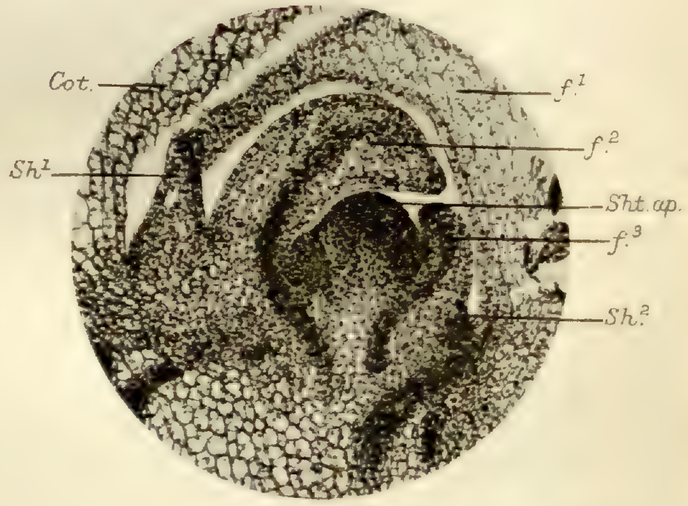

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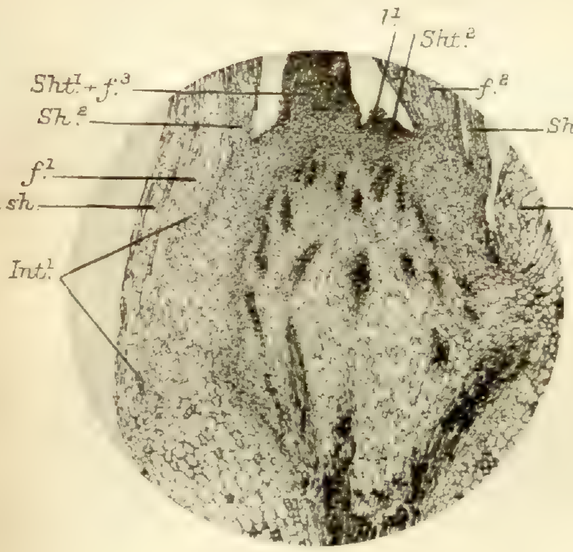

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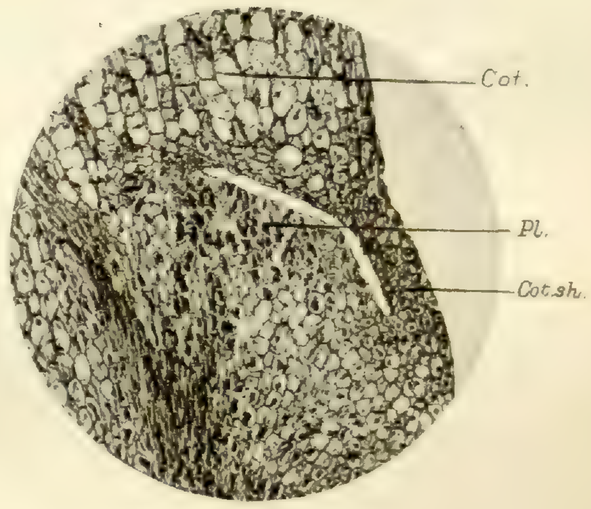

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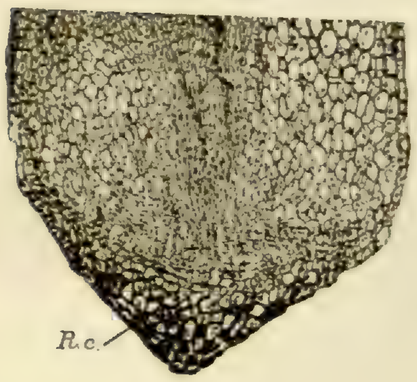

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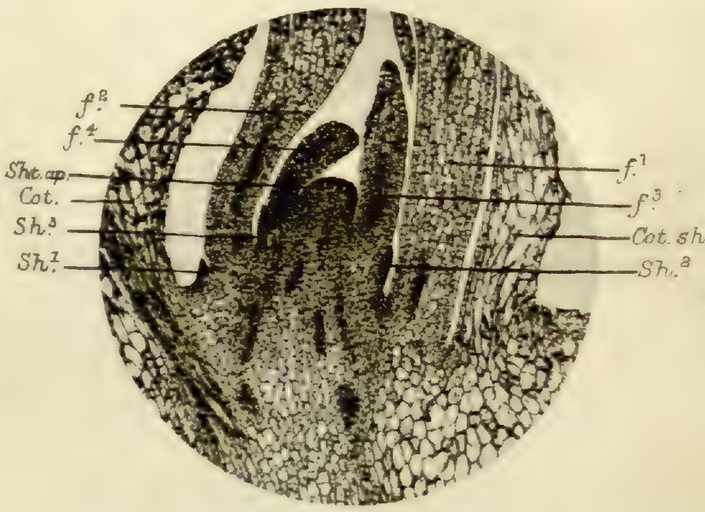

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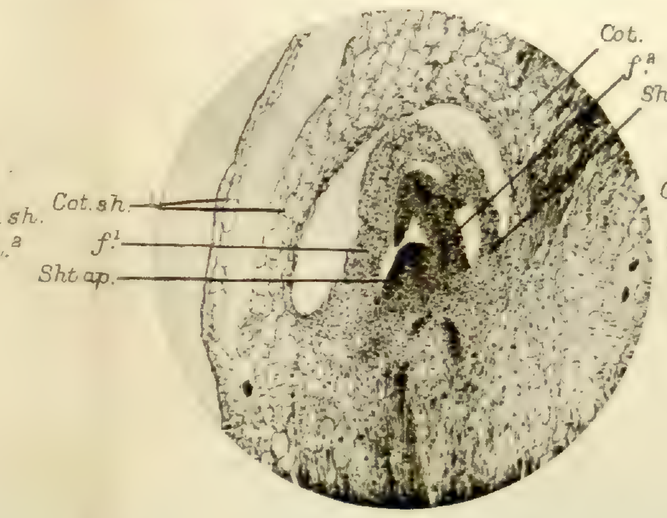

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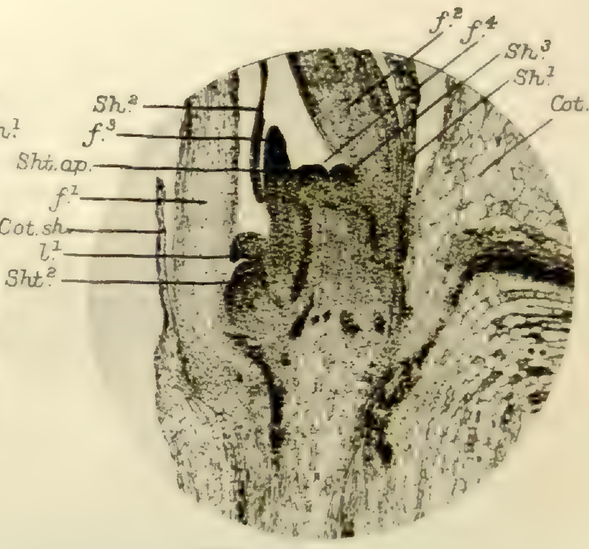

27.

W. Edgar Evans, photo

Huth, coll

EVANS—ON THE FURTHER DEVELOPMENT DURING GERMINATION OF MONOCOTYLEDONOUS EMBRYOS.

FIG. 19. Rad. long. sect. through plumule of *R. aculeatus* embryo . . ×80
FIG. 20. Rad. long. sect. through plumule of young seedling of *R. aculeatus*, showing the appearance of the 1st kataphyll . . ×48
FIG. 21. Rad. long. sect. through plumule of more advanced seedling of *R. aculeatus*, showing 1st, 2nd, and 3rd kataphylls . . ×27
FIG. 22. Rad. long. sect. through plumule of seedling of *R. aculeatus*, showing vascular bundles passing into the kataphylls . . ×50
FIG. 23. Long. sect. through seedling of *R. aculeatus*, showing elongation of epicotyl and formation of rhizome bud in axil of 2nd kataphyll. This section does not pass through the centre of the primary axis, part of which along with the 3rd kataphyll are seen at sht. +f.3 . . . . . ×21
FIG. 24. Rad. long. sect. through plumule of embryo of *Danae Laurus*, Medic. . . . . ×80
FIG. 25. Rad. long. sect. through seedling of *Semele androgyna*, Kunth. . ×44
FIG. 26. Rad. long. sect. through plumule of young seedling of *Smilax sp.*, showing leaves and axis . . . . . ×46
FIG. 27. Rad. long. sect. through seedling of *Smilax sp.*, showing basal kataphyll with axillary rhizome bud, axis with leaf, &c. . . ×33

Peziza Willkommii, R.H., on Larix occidentalis, Nutt., and Larix leptolepis, Gord.

BY

A. W. BORTHWICK, D.Sc.,

LECTURER ON FOREST BOTANY, UNIVERSITY OF EDINBURGH.

With Plate LV.

THE principal aim in sylviculture, as well as in the sister sciences of horticulture and agriculture, is not merely to grow plants, but rather to direct their development in such a way that they will produce the most useful material. This necessitates a certain amount of interference with the plant's natural course of development and habit of life. It is not always possible to avoid placing the plants in somewhat unnatural positions, and, again, a large number of individuals of the same species are frequently grown in close proximity to each other. Cultivated plants are thus not under the same conditions as those which grow naturally. The less we interfere with nature and allow the plants to grow under as natural conditions as artificial cultivation will permit, the better will be the results. This is a fact of great importance, especially in sylviculture, where the trees require a long period in which to complete their development.

In horticulture and agriculture the case is slightly different. Here the plants are not so long lived, and consequently not exposed to such a prolonged strain. Under cultivation, plants tend to become less resistant in regard to their natural enemies in the shape of insects and fungi. Consequently they are more liable to be affected by epidemic diseases which may cause large pecuniary loss not only to the cultivator, but to the country at large.

Plant pathology is concerned with the disease of plants just as medicine and veterinary science is concerned with the cure of disease of man and animals. The plant pathologist's scope is, however, more limited. Individual attention cannot be given to each plant in a forest, and consequently the method by which success is most likely to be attained is that of pre-

[Notes R.B.G., Edin., No. XXI, August 1909.]

vention. That is to prevent the outbreak of disease in the first instance, or, if it has once appeared, to prevent its further spread. Though the rules and precautions to be adopted are simple enough, still they are extremely difficult to put into practice. It is only within recent years that cultivators in general are beginning to realise how infectious many plant diseases are, but even yet in the majority of cases it is only after a disease has become epidemic and has occasioned considerable and irreparable damage that the advice of the plant pathologist is sought.

There are cases enough on record where valuable crops can no longer be cultivated owing to the ravages of disease which might have been prevented from occurring at all, or at least checked or considerably modified in its early stages. Such has been our unfortunate experience with the European larch. As the result of planting in unfavourable soils and situations, its predisposition to canker caused by *Peziza Willkommii* has been so much increased as to very seriously interfere with its profitable cultivation. It is therefore not surprising that attempts have been made to find a substitute in the shape of some other species of larch which would resist the ravages of the canker fungus.

Within comparatively recent years two species have been introduced in the hope that they would be less liable to attack, if not immune from the disease. These two species are Japanese larch (*Larix leptolepis*) and the western larch (*Larix occidentalis*).

The western or occidental larch was discovered in the year 1826 by Douglas, but over fifty years elapsed before it was introduced into this country. For some reason or other, possibly the difficulty in securing seed, and consequently through the scarcity of plants, this tree has not become very widely known in Britain. Mr. H. J. Elwes, after several attempts to secure a supply of seed, was finally successful in securing a small quantity in the year 1903. This he distributed to arboriculturists in many parts of the country in the hope that this species would be "less liable to the attack of *P. Willkommii* than the common larch." Speaking of the germination of the seed which he distributed, Mr. Elwes says: "The seedlings raised in 1904, from the seed which I distributed, have grown in several places, best perhaps at Murthly, under the care of Mr. Lawrie, where in September 1906 I saw some hundreds thriving very well, though not so large as the common larch of the same age."

In the winter 1908–09 two specimens were sent from Murthly to the Royal Botanic Garden, one of which had, unfortunately, developed unmistakable symptoms of attack by *P. Willkommii*. This plant is shown in Plate V, Figs. 1 and 2. The cankered portion, as will be seen in Fig. 1, is situated at

to its vast importance. A large amount of close observations and experimental work is necessary in order to decide which new species are likely to give better results than those at present under cultivation, and no doubt experimental forest-gardens and demonstration forests would provide a means of answering many of those highly important questions.

EXPLANATION OF THE FIGURES IN PLATE LV.

Illustrating Dr. A. W. Borthwick's paper on "Peziza Willkommii, R.H., on *Larix occidentalis*, Nutt., and *Larix leptolepis*, Gord."

FIG. 1. Apical portion of young *Larix occidentalis*, showing where the canker originated at the base of the shoot of 1907.

FIG. 2. The cankered area at the base of the shoot of 1907, showing the fructifications of *Peziza Willkommii*.

FIG. 3. Portion of stem of *Larix leptolepis* with two cankered areas, the lower one seen in surface view, the higher one seen in profile.

FIG. 4. Part of the higher canker in Fig. 3, magnified, showing the fructifications of *P. Willkommii*.

1.

2.

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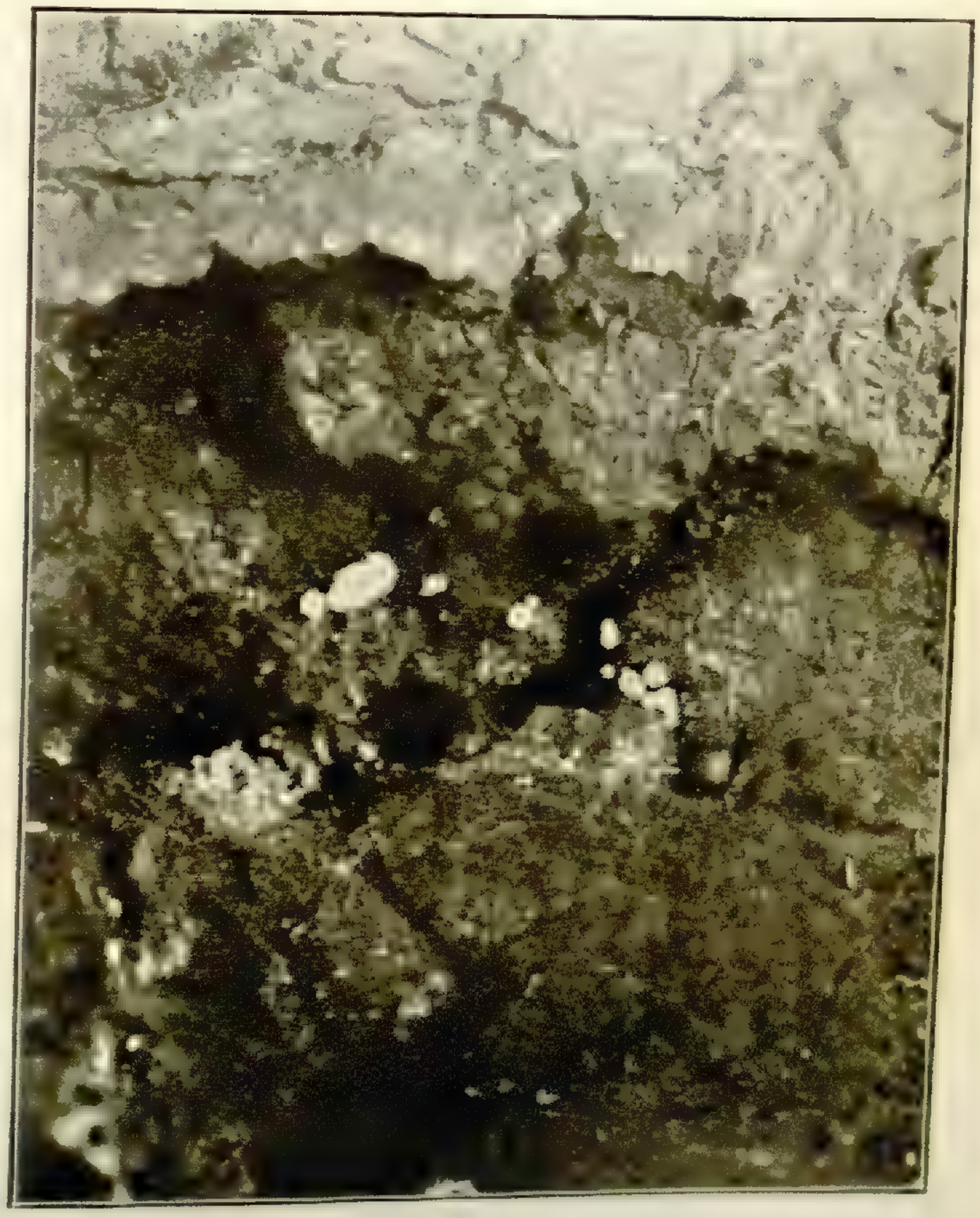

4.

BORTHWICK—LARCH DISEASE.

Research on the Proteolytic Enzymes in Fungi and Bacteria.

BY

ROBERT M. WILSON, B.Sc.,

CARNEGIE SCHOLAR.

THE presence of proteolytic enzymatic activity has been demonstrated in members of practically all the groups of the plant kingdom by several investigators, among them :—

Wurtz and Bochut, who discovered a trypsin-like ferment in *Carica papaya.*

Tommasoli and Dacommo, who found a proteolytic enzyme in *Anagallis arvensis.*

Markano, who isolated the ferment bromelin from *Ananas.*

Goroup Besanez, who found pepsin in the germinating seeds of *Vicia, Cannabis sativa, Linum usitatissimum.*

Green, who isolated from the germinating seeds of *Ricinus* a trypsin-like ferment, which had the power of converting albumin and globulin into peptone and asparagin.

For the first definite knowledge of proteolytic enzymatic activity in bacteria, however, we are indebted to Bitter, who in 1887 isolated from cultures of *Vibrio choleræ-asiaticæ* and *Vibrio Finkler-Prior*, a ferment which was capable of dissolving gelatine and fibrin.

The fundamental work in connection with the activities of proteolytic enzymes is that of Fermi, who, in his various experiments with members of the higher and lower forms of plant life, gives many instances of proteolysis.

These results and those obtained by other observers, combined with the general indications of the almost universal occurrence and activity of proteolytic enzymes throughout animal and vegetable life, would seem to render a systematic search for such enzymes amongst fungi and bacteria desirable, in order to ascertain, if their presence may be regarded as essential to fungoid and bacterial life, the functions they have in connection with such life, and the manner in which, as well as the conditions under which, these are carried out.

I have been fortunate enough to obtain a Carnegie Scholarship for the purpose of a research in this direction, and have been

[Notes R.B.G., Edin., No. XXI, August 1909.]

granted also the privilege of working in the Mycological Department of the Heriot-Watt College, Edinburgh, under its director, Dr. Westergaard. I wish to express here my sincere thanks for this.

In the two reports which follow will be found an account of the methods employed by me and the results which I have obtained in determining whether or not proteolytic enzymatic activity is generally present in fungi and bacteria.

FIRST REPORT.

Up to the present I have confined my attention entirely to the higher fungi, as these can be most readily obtained in September and October growing in large numbers in woodland and meadow, and I have left the lower forms, which can be cultivated in the laboratory at any time for subsequent experiment.

Towards the end of September the following species of fungi were collected :—

Agaricus melleus, A. sulphureus, A. squarrosus, Merulius lacrymans, Polyporus betulinus, P. sulphureus, P. squamosus, Lactarius insulsus, L. cilicioides, Russula Clusii, Cortinarius sp., *Boletus* sp.

Preparation of Enzyme.—Each species of fungus was ground up separately in a mortar with sand and sufficient water to form a thick paste. After a homogeneous mixture had been obtained more water was added, and again the contents of the mortar were thoroughly mixed. The contents were then filtered, and to the filtrate was added twice its volume of absolute alcohol. On the addition of the alcohol a precipitate fell, which was filtered off, washed with alcohol and ether, and dried in a vacuum desiccator over concentrated sulphuric acid at room temperature.

My intention was, as stated in the account of the proposed work, to determine the proteolytic activity in each species of fungus by allowing the enzymatic preparation to act upon wheat protein, which is insoluble in water and soluble in 55 per cent. alcohol.

The method used by Kjeldahl and afterwards by Weise to obtain this protein—by extracting wheat flour with 55 per cent. alcohol and freezing the extract,—gives a very small yield, and is in addition rather long and troublesome, and the following modification suggested by Dr. Westergaard was therefore adopted :—

Preparation of Protein.—Gluten flour was extracted with three times its weight of 55 per cent. alcohol at room temperature

for twenty-four hours. To the filtered extract an equal volume of ether was added, which caused a heavy brown semi-liquid substance to separate out. This substance was, by treatment with cold absolute alcohol during several days, converted into a hard white brittle mass, which, on being suspended in cold water became soft and spongy, and again hardened, when placed in alcohol. By thus alternately washing with water and with alcohol, the preparation was purified as far as possible, and ultimately, after the last treatment with alcohol, it was washed with ether, dried in a vacuum at room temperature, and ground to powder.

Estimation of Nitrogen in Protein.—·1 gm. protein was boiled with 20 c.c. concentratd sulphuric acid (nitrogen free) and potassium sulphate till the liquid was quite clear, when potassium permanganate was added in excess and the ammonia estimated by distillation with caustic soda.

RESULTS.—*Expt.* 1. 15·9 per cent. nitrogen.
Expt. 2. 16 „ „

These results are slightly lower than those obtained by Kjeldahl, whose protein contained 17·25 per cent. nitrogen.

This powder was then used for testing the proteolytic activity of the fungi or preparations of these in the following manner :—

In each case three flasks were employed, each containing accurately the same quantity of protein, enzymatic preparation, and water. To one of these flasks tannic acid and a trace of sodium acetate were added at once, whilst the other two were placed at 50° C. for twenty hours, when they each received the same quantity of tannic acid solution and sodium acetate as the first one.

The effect of the tannic acid is to precipitate the proteids, proteoses, and peptones present so that the filtrate will only contain nitrogenous compounds of a simpler constitution than these. The amount of nitrogen found in the filtrates from the flasks, which were kept at 50° C., compared with that contained in the filtrate from the flask that was precipitated at once, will be an indication of the degree of proteolytic activity, and the results obtained expressed in c.c.'s of deci-normal ammonia may be used for comparison if the conditions as time, temperature, concentration, etc., are kept uniform.

Preliminary Experiments.—In order to test the methods, the following three determinations were carried out, using the preparations obtained in the manner already described from :—
Polyporus sulphureus, P. squamosus, Merulius lacrymans.

In each case ·5 gm. of the enzymatic preparation was dis-

solved in 20 c.c. water and filtered. Five c.c. of the filtrate were placed in each of three 100 c.c. flasks, along with ·2 gm. of the protein and 25 c.c. of water. The flasks were treated as described above, and after precipitation with tannic acid, made up to 100 c.c. with water, and the contents were filtered.

The nitrogen was in each case determined in 30 c.c. of the filtrate, with the following results :—

POLYPORUS SQUAMOSUS.

(*a*)	Flask with proteolytic activity gave			. 3·5 c.c.	$\frac{N}{10}$	NH_3
(*b*)	,,	,,	,,	. 4·0 c.c.	,,	,,
(*c*)	,, no	,,	,,	. 1·0 c.c.	,,	,,

POLYPORUS SULPHUREUS.

(*a*)	Flask with proteolytic activity gave			. 4·4 c.c.	$\frac{N}{10}$	NH_3
(*b*)	,,	,,	,,	. 3·0 c.c.	,,	,,
(*c*)	,, no	,,	,,	. ·5 c.c.	,,	,,

MERULIUS LACRYMANS.

(*a*)	Flask with proteolytic activity gave			. 3·7 c.c.	$\frac{N}{10}$	NH_3
(*b*)	,,	,,	,,	. 4·5 c.c.	,,	,,
(*c*)	,, no	,,	,,	. ·6 c.c.	,,	,,

These results show clearly that active proteolyses has been going on in all three cases.

The accuracy was not satisfactory, especially in the case of *P. sulphureus*, but this was found to be due, not to the method, but to minor errors in the manipulations ; in all the subsequent determinations the results of the duplicates have come out practically the same.

In order to test the effect of a slight trace of acid or alkali on the activity the following experiment was carried out with the enzymatic preparation obtained from *P. squamosus*.

·5 gm. of the preparation was dissolved in 30 c.c. water, filtered, and 3 c.c. of filtrate put into each of nine test tubes along with ·2 gm. of protein. To the first three tubes hydrochloric acid was added, so that in 6 c.c. of the resulting solution the acidity would be equal to ·1 per cent. To the second three tubes sodium carbonate was added, so that in 6 c.c. of resulting solution the degree of alkalinity would be equivalent to that of acidity in the first three. To the last three tubes 3 c.c. of water were added.

Each series of three tubes was then treated in the same manner as described in the case of *P. sulphureus*, etc., and the following results obtained :—

Acid Solution.

(*a*) Tube with proteolytic activity gave . 2·4 c.c. $\frac{N}{10}$ NH_3
(*b*) ,, ,, ,, . 2·7 c.c. ,, ,,
(*c*) ,, no ,, ,, . 1·8 c.c. ,, ,,

Alkaline Solution.

(*a*) Tube with proteolytic activity gave . 1·8 c.c. $\frac{N}{10}$ NH_3
(*b*) ,, ,, ,, . 1·9 c.c. ,, ,,
(*c*) ,, no ,, ,, . 1·6 c.c. ,, ,,

Normal Solution.

(*a*) Tube with proteolytic activity gave . 1·2 c.c. $\frac{N}{10}$ NH_3
(*b*) ,, ,, ,, . 1·5 c.c. ,, ,,
(*c*) ,, no ,, ,, . ·5 c.c. ,, ,,

These results show that in this case acid aids while alkali retards proteolyses.

The several species of fungi mentioned at the beginning were examined in the following manner :—

1. Auto-digestions.
2. Preparation of enzyme.
3. Direct examination of the juice of the fungi.

1. The auto-digestions were made chiefly in order to have material to fall back upon for confirmation of results, and were carried out in the following way :—

In the case of each fungus two equal quantities were weighed out, one portion was boiled for a few minutes, both lots were then ground up separately in a mortar with sand and an equal volume of water till a homogeneous mixture was obtained ; they were then bottled and shaken up with a little toluol.

2. The preparation of the enzyme was carried out as already described.

3. Whilst the above-mentioned preparations were laid aside to be used afterwards for a detailed examination of the nature of each enzyme, the proteolytic activity of each of the fifteen

species was tested by using the juice pressed from the fresh fungi.

Fifty gm. of each of the species were ground up with sand and a few c.c.'s of distilled water, filtered, and the filtrate made up to 100 c.c. These liquids were then used for experiment on the lines described above in the case of *P. squamosus*.

In each case nine tubes were used, making 135 in all, which were divided into lots of three flasks each.

The first three flasks each received 8 c.c. of the fungus juice and 22 c.c. of distilled water.

The second three flasks each received the same amount of juice and so much sulphuric acid and water to bring the mixture to a total volume of 30 c.c. containing so much acid that the total acidity corresponded to ·1 per cent. sulphuric acid.

The third set of three flasks were made up as above, with the sole difference that sodium carbonate was used instead of sulphuric acid in quantities to make 30 c.c. of the liquid have a degree of alkalinity exactly equivalent to the acidity of the previous lot.

After the tubes were all ready, ·2 gm. of the protein was added and the digestions carried out at 50° C. for four hours, when the proteids, peptones, and proteoses, etc., were precipitated, leaving amino acids in solution.

SECOND REPORT.

As mentioned in the first report extracts of fifteen fungi were brought into contact with protein.

In each case three sets of three tubes were used. In one set the extract was taken directly from the fungus ; to the extract in the second set was added hydrochloric acid to such an extent that the total acidity was ·1 per cent. ; to the extract in the third set sodium carbonate was added, so that the resulting alkalinity was equivalent to the degree of acidity in the second set.

The digestions of the protein were carried out at 50° C. for four hours, when the peptones, etc., were precipitated, leaving amino acids in solution.

The liquid was then filtered and evaporated down with a little concentrated sulphuric acid till fumes of the latter were observed to come off, when other 20 c.c. were added and the flask heated till the contents were clear. Potassium permanganate was then added in excess to oxidise any organic material present.

The flasks were then washed into larger ones, and concen-

trated caustic soda added when ammonia was distilled over and absorbed by deci-normal sulphuric acid.

The results obtained are found in the following table whose figures denote tenths of 1 c.c. deci-normal ammonia.

(Flasks (1) and (2) are duplicates, flask (3) is a blank.)

AGARICUS AGGREGATUS.			Flasks.		
			(1)	(2)	(3)
Digestion of protein by enzyme in	HCl soln.	.	30	—	11
,, ,, ,,	Na_2Co_3 ,,	.	26	24	15
,, ,, ,,	H_2O ,,	.	22	23	15
PEZIZA SP.					
Digestion of protein by enzyme in	HCl soln.	.	40	40	25
,, ,, ,,	Na_2Co_3 ,,	.	35	36	30
,, ,, ,,	H_2O ,,	.	36	—	30
A. AGARICUS (SPECIES NOT DETERMINED).					
Digestion of protein by enzyme in	HCl soln.	.	26	25	20
,, ,, ,,	Na_2Co_3 ,,	.	23	22	20
,, ,, ,,	H_2O ,,	.	38	36	17
AGARICUS ARVENSIS.					
Digestion of protein by enzyme in	HCl soln.	.	58	57	50
,, ,, ,,	Na_2Co_3 ,,	.	57	55	50
,, ,, ,,	H_2O ,,	.	—	—	—
AMANITA VAGINATUS.					
Digestion of protein by enzyme in	HCl soln.	.	30	29	25
,, ,, ,,	Na_2Co_3 ,,	.	24	25	20
,, ,, ,,	H_2O ,,	.	30	30	20
No. 27 (NAME NOT DETERMINED).					
Digestion of protein by enzyme in	HCl soln.	.	30	30	20
,, ,, ,,	Na_2Co_3 ,,	.	25	24	22
,, ,, ,,	H_2O ,,	.	25	24	20
AGARICUS MELLEUS.					
Digestion of protein by enzyme in	HCl soln.	.	10	—	5
,, ,, ,,	Na_2Co_3 ,,	.	15	14	10
,, ,, ,,	H_2O ,,	.	15	16	7

						Flasks.		
						(1)	(2)	(3)
Lactarius insulsus.								
Digestion of protein by enzyme in			HCl soln.		.	14	15	10
,,	,,	,,	Na_2Co_3	,,	.	10	9	7
,,	,,	,,	H_2O	,,	.	10	10	2
Russula cyanoxantha.								
Digestion of protein by enzyme in			HCl soln.		.	15	14	10
,,	,,	,,	Na_2Co_3	,,	.	17	18	15
,,	,,	,,	H_2O	,,	.	20	19	5
Agaricus sp. B.								
Digestion of protein by enzyme in			HCl soln.		.	20	19	14
,,	,,	,,	Na_2Co_3	,,	.	15	15	10
,,	,,	,,	H_2O	,,	.	15	14	10
Lactarius cilicioides.								
Digestion of protein by enzyme in			HCl soln.		.	25	—	17
,,	,,	,,	Na_2Co_3	,,	.	19	18	12
,,	,,	,,	H_2O	,,	.	—	—	—
Agaricus sp. C.								
Digestion of protein by enzyme in			HCl soln.		.	18	18	15
,,	,,	,,	Na_2Co_3	,,	.	14	14	12
,,	,,	,,	H_2O	,,	.	—	—	—
Polyporus betulinus.								
Digestion of protein by enzyme in			HCl soln.		.	25	26	20
,,	,,	,,	Na_2Co_3	,,	.	—	16	13
,,	,,	,,	H_2O	,,	.	22	21	15
Russula Clusii.								
Digestion of protein by enzyme in			HCl soln.		.	16	15	10
,,	,,	,,	Na_2Co_3	,,	.	15	14	10
,,	,,	,,	H_2O	,,	.	13	12	8
Agaricus squarrosus.								
Digestion of protein by enzyme in			HCl soln.		.	18	17	13
,,	,,	,,	Na_2Co_3	,,	.	20	19	11
,,	,,	,,	H_2O	,,	.	14	13	9

On analysing the above table, subtracting the figures in the third column from those in columns (1) and (2) and taking the average, the figures set out in the following table are obtained :—

Fungus	HCl	Na_2Co_3	H_2O
Agaricus aggregatus	19·0	10·0	7·5
Peziza sp.	15·0	5·5	5·5
Agaricus sp. A.	5·5	2·5	20·0
Agaricus arvensis	7·5	6·0	—
Amanita vaginatus	4·5	2·5	10·0
No. 27	10·0	2·5	4·5
Agaricus melleus	5·0	4·5	8·5
Lactarius insulsus	4·5	2·5	8·0
Russula cyanoxantha	4·5	2·5	15·5
Agaricus sp. B.	5·5	5·0	4·5
Lactarius cilicioides	8·0	6·5	—
Agaricus sp. C.	3·0	2·0	—
Polyporus betulinus	5·5	3·0	6·5
Russula Clusii	5·5	4·5	4·5
Agaricus squarrosus	4·5	8·5	4·5

In studying the above table one observes—

1. That proteolytic activity is present in every case.

2. That the proteolytic activity in the acid medium is distinctly highest in three, viz. :—*Agaricus aggregatus, Peziza,* and No. 27.

3. That the proteolytic activity in the alkaline medium is distinctly highest in one, viz. :—*Agaricus squarrosus.*

4. That the proteolytic activity in the media to which neither acid nor alkali were added is distinctly highest in six, viz. :—*Agaricus* A., *Amanita vaginatus, Agaricus melleus, Lactarius insulsus, Russula cyanoxantha,* and *Polyporus betulinus.*

5. That proteolytic activity is greater in acid than in alkaline media in three, viz. :—*Lactarius cilicioides, Agaricus* C., and *Agaricus arvensis.*

6. That proteolytic activity is increased by both acid and alkali in *Agaricus aggregatus.*

7. That the proteolytic activity is practically the same in all three media in the case of *Agaricus* B.

Having finished this experiment with the above members of the higher fungi, and made enzymatic preparations from several others which have yet to be examined, pure cultures were made of the following lower fungi and bacteria :—

Mucor Mucedo, Mucor spinosus, Mucor racemosus, Aspergillus niger, Aspergillus glaucus, Aspergillus oryzæ, Monilia

candidia, Chalara mycoderma, Oidium lactis, Cladosporium herbarium, Bacillus subtilis, Tyrothrix tenuis, Bacillus prodigiosus, Streptothrix lactici acidi.

After getting pure cultures of the above fungi, ten flasks containing sterile malt extract were inoculated with the ten forms.

The pure cultures of the bacteria were introduced separately to flasks containing sterile glucose peptone (1 per cent. peptone, 4 per cent. glucose). When the development had proceeded sufficiently far the fungi or bacteria were separated from the nutrient medium, and both organisms and media tested for proteolytic activity.

In the case of the fungi the malt extract was filtered off and the mass of fungus mycelium washed a few times with distilled water. The fungus was then ground into a fine state with sand and water, and the extract filtered off. Twenty-five c.c. of the filtrate were put into each of three flasks containing ·2 gm. protein. To one 5 c.c. of a 20 per cent. solution of tannic acid was at once added, and all three flasks incubated at 47° C. for five hours.

After this time the other two flasks received 5 c.c. of tannic acid ; all three made up to 50 c.c. and filtered.

Twenty-five c.c. of the filtrate were evaporated down with a little concentrated sulphuric acid till fumes of the latter came off, when other 20 c.c. were added, and the flasks heated till the contents were clear, when distillation was carried out in the way already mentioned.

The malt extract was tested in the same manner as the mycelium extract, 25 c.c. being used.

So far the experiments with *Aspergillus niger* and *Cladosporium herbarium* have been completed with the following results :—

(Figures represent tenths of 1 c.c. deci-normal ammonia.)

Result of digestion with—

	Medium.			Extract from Fungus.		
	(1)	(2)	(3)	(1)	(2)	(3)
Aspergillus niger . .	127	127	30	20	20	10
Cladosporium herbarium . .	42	41	21	18	17	10

from which we get the following figures, representing average proteolytic activity in the medium and mycelium :—

	Medium.	Extract from Mycelium.
Aspergillus niger . . .	97	10
Cladosporium herbarium .	20·5	7·5

It will be noticed that proteolytic activity is present in both extracts in both fungi, but it is extremely marked in the medium in the case of *Aspergillus niger*.

This indicates that the fungus during its growth excretes into the medium, in which it is situated, a proteolytic enzyme, which brings the complex proteids into a fit state for assimilation by the organisms.

In experimenting with *Bacillus prodigiosus*, the bacteria were separated from the medium by means of a centrifugal machine, and ground in a mortar with solid carbon dioxide and ether. Ten c.c. of distilled water were then added, and 3 c.c. of the mixture put into each of three flasks with ·2 gm. protein, and the experiment carried out as in the other cases. The medium was filtered through a Chamberland filter in order to get rid of the remaining bacteria, and then used for the digestions in the usual manner.

Number XXII.

NOTES

FROM THE

ROYAL BOTANIC GARDEN,

EDINBURGH.

OCTOBER 1911.

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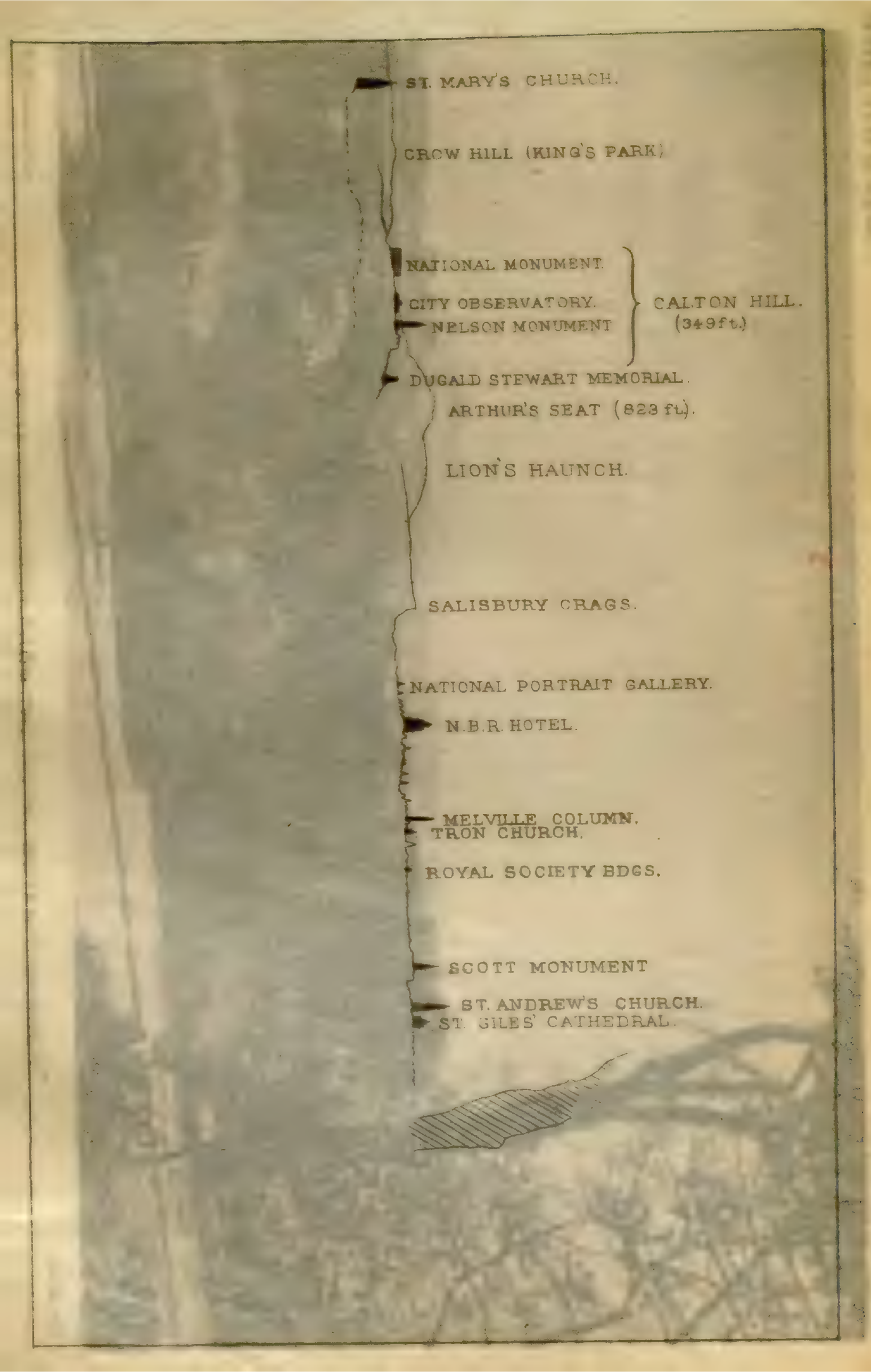
R.M. Adam, phot. Huth, coll.

"A VIEW OF EDINBURGH FROM THE ROYAL BOTANIC GARDEN."


ST. MARY'S CHURCH.
CROW HILL (KING'S PARK)
NATIONAL MONUMENT.
CITY OBSERVATORY.
NELSON MONUMENT
CALTON HILL. (349ft.)
DUGALD STEWART MEMORIAL.
ARTHUR'S SEAT (823 ft).
LION'S HAUNCH.
SALISBURY CRAGS.
NATIONAL PORTRAIT GALLERY.
N.B.R. HOTEL.
MELVILLE COLUMN.
TRON CHURCH.
ROYAL SOCIETY BDGS.
SCOTT MONUMENT
ST. ANDREW'S CHURCH.
ST. GILES' CATHEDRAL.

On Utricularia prehensilis, E. Meyer.

BY

BERTHA CHANDLER, M.A., B.Sc.

With Plate LVII.

UTRICULARIA PREHENSILIS—a sub-aquatic species found in various localities in Tropical and South Africa, and Madagascar—is of considerable interest, as it presents many important differences from such truly aquatic species as *U. emarginata*, recently described by me.*

The material used in the following description was grown from a seed taken from the herbarium by Mr. L. Stewart, Foreman of the Glass Department, Royal Botanic Garden, Edinburgh. He made the following notes: "Sown in the last week of June the seed germinated in the second week of July 1909. The first flowers appeared on the first of June 1910. By October a mass of flowering material was obtained." Natural pollination and fertilisation are not so easy or so speedy processes in this as in other species of *Utricularia*, but some seed has been procured through artificial pollination, sufficient to give promise of a satisfactory examination of the germination later on, as well as of the determination of the position of the species in Glück's Classification.†

In its general appearance *Utricularia prehensilis* (Fig. 1) presents some striking differences from the aquatic species, for its leaves are riband shaped, not terete and linear like those of *U. vulgaris*, *emarginata*, and others. The riband leaves float on the surface of the water, which covers the mud in which the plant thrives. The flower-stalks are aerial, rising to a considerable height, and, as the name of the plant suggests, twine round a support. The direction seems always to be dextrorse.

A short general description of the plant, with figures, is given by Stapf‡, and he mentions that this species is

* Chandler in Ann. Bot., xxiv (1910).

† Glück, Biologische und morphologische Untersuchungen über Wasser-und Suümpfgewächse, Teil ii. Jena, 1906.

‡ Stapf in Hooker's Icones Plantarum, t. 2798.

known under various synonyms—*U. lingulata*, *U. hians*, *U. madagascariensis*.

FLOWER STALK.—The origin of the flower stalk of *U. prehensilis* does not differ from that of *U. vulgaris*. It bears also at its base a mass of water shoots, leaves, and rhizoids. The flower shoot is twining, and the average length about 25 cm., sometimes longer. The flowering is more profuse than in *U. vulgaris*, and the flowers (see Fig. 1 and Stapf's figures*) are yellow in colour. At the base of a flower stalk we find, as in other species of *Utricularia*, a number of rhizoids (Figs. 2 and 3). A limited number, usually three or four, are to be found also at some distance up the stalk. The rhizoids in *U. prehensilis* are not so rudimentary as in *U. vulgaris*, but are fairly well developed. The difference in habitat in the two species would account for the fact that in *U. prehensilis* the rhizoids are more developed, their use in the greater sub-stratum of mud being very much greater. As Glück † has pointed out, the anchoring function of rhizoids is, to a large extent, lost in wholly submerged species, and the development of these organs is consequently not so great as in the sub-aquatic species. The rhizoids in appearance (Fig. 4) are very similar to those of *U. neglecta* figured by Glück, ‡ but whereas in *U. neglecta* the leaves and rhizoids are alike, in *U. prehensilis* the appearance of the leaves, which are long and flat, in no way resembles that of the rhizoids. The rhizoids are divided into segments, the usual number being nine or ten on each side. The segments are simple, straight, and usually undivided, though occasionally at the base of an older rhizoid, division of the segment itself takes place (Fig. 4*a*) giving the rhizoid of this species there the general appearance of that of *U. neglecta*. The rhizoid segments are given off regularly and alternately at right angles to the main axis. Unlike *U. vulgaris* the tips of these segments do not possess circinate ptyxis, but are straight like the growing points of the water shoots. The segments are covered entirely with glands, except at the very tip and base (Fig. 4). Glands also are present at intervals on the main portion of the rhizoids. These rhizoids measure some two to three times the length of the rudimentary rhizoids of *U. vulgaris*. Whereas, too, in this latter species, metamorphosis of the rhizoids into ordinary water shoots is common, in *U. prehensilis* the rhizoids are organs apart from the water shoots, and in no case was metamorphosis observed.

MORPHOLOGY.—In diameter the flower stalk is about 1–1.5 mm., and is characterised by a reduction of aerenchyma compared to the water shoot. The amount of aerenchyma is naturally greatest at the base of the flower stalk which is under water.

* Stapf in Hooker's Icones Plantarum, t. 2798.
† Glück, loc. cit. ‡ Glück, loc. cit. Taf. 4.

A section across the middle of an aerial flower stalk shows (Fig. 5) a distinct epidermis, composed of large cells somewhat thickened on their outer walls, bounding the section. A small amount of aerenchyma and large round cells, loosely arranged, form the cortex. The endodermis is composed of large clear cells thickened on their radial walls. A ring of xylem surrounds the pith with small scattered patches of phloem. There are also one or two irregularly distributed patches of vascular tissue in the ground tissue, as in *U. emarginata* * and *U. brachiata*.† The pith cells are small in the vicinity of the xylem ring, but very large towards the centre of the section.

As well as rhizoids, a great number of ordinary water shoots, bearing leaves and bladders, are to be found at the base of an aerial flower stalk, and the leaves are often found springing immediately from the base. In structure the water shoots are simple, having a central vascular strand, surrounded by air tissue and epidermis (Fig. 7*a*). As in all other parts of the plant, the water shoots are covered at intervals with small projecting glands.

The leaves are given off as branches of the water shoots. At their base they do not differ in any respect from the shoots themselves, but when the flattening of the leaf begins, the main nerve divides into three, so that a section of a leaf shows three vascular strands surrounded by air tissue, and an epidermis composed of slightly thicker and polygonal rather than brick-shaped cells, as at the base, or in a section of the water shoot (Figs. 6 and 7). Stomata with two guard cells are found at intervals on the leaves with the glands.

The bladders differ in shape from those of *U. vulgaris* (Fig. 8). Their origin and development are as in other species of *Utricularia*, each one arising as a roundish knob on a stalk, which is comparatively long when fully developed. The bladders of *U. prehensilis* do not possess hairs at the mouth, but two horn-like elongations of the bladder itself (Fig. 8*a*). The interior of the bladder is characterised by the absence of quadrifid processes, and is covered only with bifid processes (Fig. 9). The collar is densely covered with stalked glands all of the same shape, while other glands, bicellular in construction, form a transition near the exterior to the projecting glands without stalks, with which the whole exterior of the bladder and the stalk is covered, as are all other submerged parts of the plant. Inside the bladder, decayed brown matter is found, but no distinct entire micro-crustacea. The fact that the bladders of this species are sunk in mud, and therefore more liable to decay, would explain this.

* Chandler, in Ann. Bot., xxiv (1910).
† Compton, in New Phytologist, April 1909.

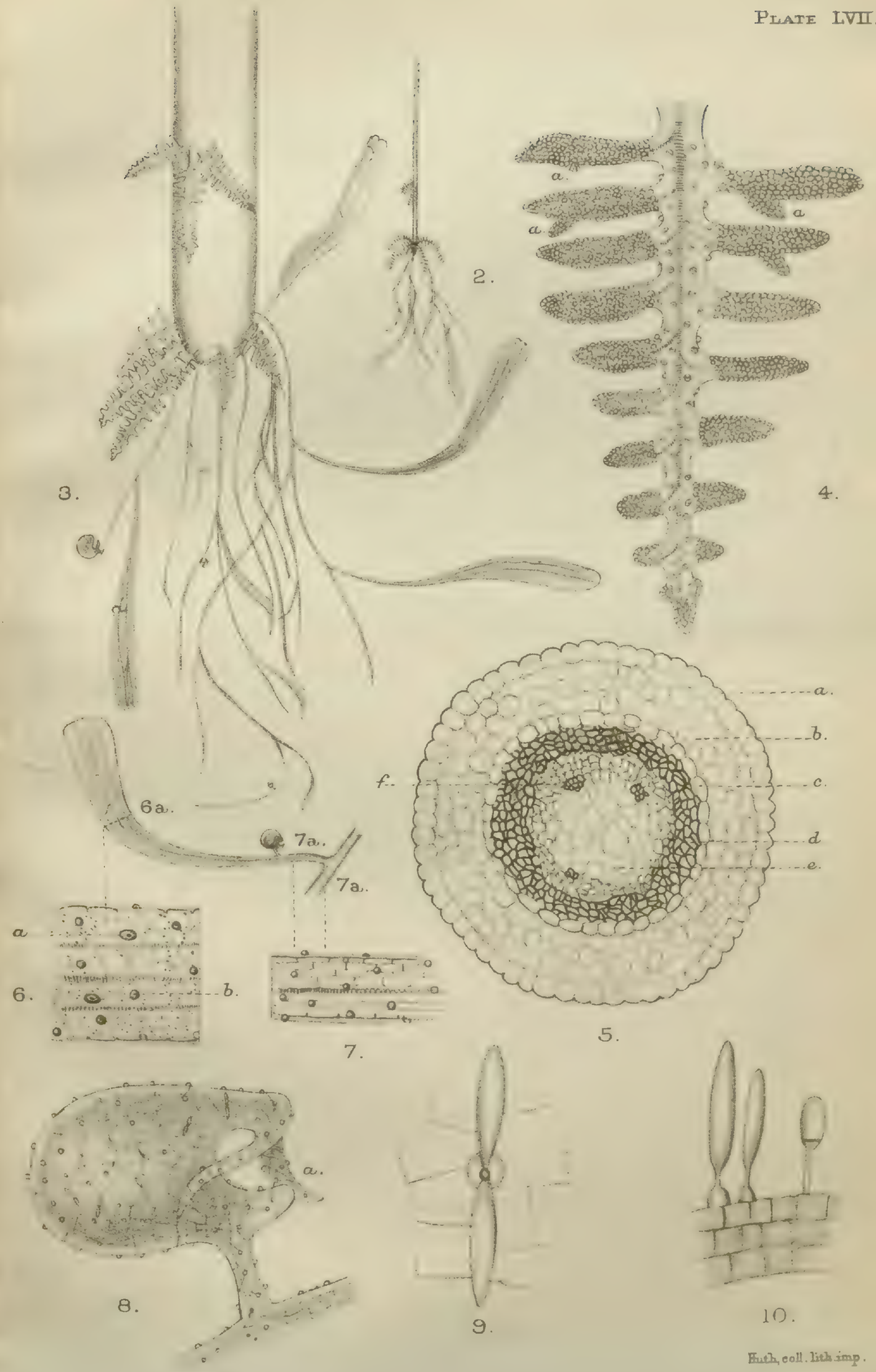
EXPLANATION OF FIGURES IN PLATE LVII.

Illustrating Miss Chandler's paper on "Utricularia prehensilis, Meyer."

FIG. 1. *Utricularia prehensilis*. Nat. size. From a photograph by Mr. R. Adam.
FIG. 2. Base of flower stalk. Nat. size, showing rhizoids.
FIG. 3. Same magnified. (×17.)
FIG. 4. Rhizoid with rhizoid segments. (×75.)
a. Secondary branch of rhizoid segment.
FIG. 5. Flower stalk in transverse section showing (× 74)—
a. Epidermis.
b. Aerenchyma.
c. Endodermis.
d. Ring of xylem.
e. Pith.
f. Scattered vascular tissue.
FIG. 6. Portion of flat part of leaf, showing internal structure (×14)—
a. Stomata.
b. Glands.
FIG. 6A. Corresponding portión of leaf. (×4.)
FIG. 7. Narrower part or petiole of leaf, showing structure. (×14.)
FIG. 7A. Corresponding portion of leaf and water-shoot. (×4.)
FIG. 8. Bladder, showing hornlike processes (*a*). (×45.)
FIG. 9. Bifid processes inside the bladder. (×500.)
FIG. 10. Glands at the mouth of the bladder. (×500.)

1.

Utricularia prehensilis, Meyer — Chandler.



Huth, coll. lith. imp.

Note on Donatia novae-zelandiae, Hook. f.

BY

BERTHA CHANDLER, M.A., B.Sc.

With Plate LVIII.

DONATIA NOVAE-ZELANDIAE, Hook. f., is a little cushion plant of moss-like habit, growing on the heights of New Zealand and Tasmania. With *Donatia fasicularis*, Forst., found in antarctic America, it forms an isolated genus *Donatia*, the systematic position of which has been much debated. Hooker,* who first described it, referred the genus to Saxifrageae. At the same time he pointed out that the insertion of the stamens within an epigynous disk, the extrorse anthers, and the pendulous placentation were characters which pointed to an affinity with Stylidieae. Subsequently Von Mueller † definitely included the genus in the Stylidieae. Engler,‡ however, retained it in Saxifragaceae as a special tribe, the Donatieae, of his larger group the Saxifragoideae, and Schoenland § also definitely excluded the genus from Stylidiaceae.

More recently Mildbraed,‖ following the lead of Von Mueller, has taken *Donatia* to be a constituent subfamily, Donatioideae, of the Stylidiaceae, which otherwise includes the subfamily Stylidioideae only. We may admit with Mildbraed that the position of the Stylidiaceae amongst the Campanulateae is assured, and also that the relationship with the Campanulaceae themselves is perhaps not so close as has been urged. Whether, however, there is ground for saying, as he does, that the Stylidiaceae, as he constitutes it, is to be regarded as a small independent branch of the Campanulateae which has taken origin in the antarctic, is a matter for further consideration. Is his family of the Stylidiaceae really a natural one? The Stylidioideae with sympetalous flowers and a gynostemium, and the Donatioideae with a chori-

* Fl. Nov. Zel., i, p. 81, t. 20.
† Nuov. Giorn. Bot. Ital., xi, July 1879.
‡ Engler in Engler and Prantl, Natürliche Pflanzen-Familien, iii, 2a, p. 67.
§ Schoenland, Candollaceae in Engler and Prantl, Pflanzenfam. iv, 5, p. 283.
‖ Mildbraed, Stylidiaceae in Engler's Pflanzenreich iv, p. 278.

petalous corolla and free stamens, appear to him without doubt to have relationship, from the fact that the leaf-structure in the two subfamilies agrees, and both have inulin as a reserve material. Their general habit also is alike. There is no doubt that except for the extrorse anthers the evidence is all in favour of *Donatia* being placed in the alliance of the Campanulateae rather than in the family of the Saxifrageae, as was the case in the older classification; but the justification for Mildbraed's further step of combining the subfamily Donatioideae with the subfamily Stylidioideae in the subfamily Stylidiaceae is not at all evident. The differences between these two groups seem as great as, if not greater than, those between any of the families of the Campanulateae. Compare, for example, the Campanulateae and the Stylidiaceae: in the former we have the flower actinomorphous, 5-merous, sympetalous, except for the 3-merous gynoecceum, the anthers are free, introrse, and there is one style with collecting hairs; in the latter the flower is zygomorphous, 5-merous in perianth, sympetalous, and with two stamens united with the style in a stylar column. In relation to these *Donatia* shows a flower which is actinomorphous, choripetalous, 5-merous in the perianth, the stamens 2-3 free from the style, and the ovary divided into 2-3 chambers. Such evidence might warrant, surely, *Donatia* being regarded as a distinct order, Donatiaceae, of the cohort Campanulateae, rather than as a subfamily of the Stylidiacea.

No observations seem to have been recorded of the morphology of *Donatia novae-zelandiae* (Fig. 1), and I therefore take opportunity to make known a few facts which I have been able to observe in material of the plant obtained from specimens sent to the Regius Keeper, Royal Botanic Garden, Edinburgh, by Dr. Cockayne, who collected it on the heights of Stuart Island, New Zealand.

STEM.—In a transverse section the stem of *Donatia novae-zelandiae* shows (Fig. 3) a central mass of xylem with fairly large development of cortex and cork. The pith is relatively small, and composed of large slightly thickened cells. Surrounding the pith is the xylem, composed of regular tracheids—spiral, reticular, and annular. There is little xylem parenchyma. Where a side branch is given off, the xylem tracheids are elongated in a radial direction. Phloem is found in patches around the xylem. An endodermis, of sometimes one distinct layer, sometimes more, of oblong thickened cells with granular contents, is present. Usually these cells lie adjacent, but often project slightly one towards the other (Fig. 3*d*). The cortex is largely developed. The cells composing it are round and fairly uniform in size, slightly thickened and loosely arranged with large intercellular spaces. No resiniferous secreting system such as is said to occur

in *Donatia magellanica* * is visible here. Bounding the cortex on its outer side are two or three rows of cork cells. They are different from those of the cortex, being squarish in shape, with thickened walls, and they are filled with oily and granular contents. From the outermost layer, at intervals, obliquely septate hairs are given off, the basal cells of which contain oily and granular matter like the cork cells (Figs. 3 and 4).

HAIRS.—The characteristic septate hairs of *Donatia novae-zelandiae* are silky in appearance, and form a dense matting at the base of the leaves which are closely adpressed to the stem. The ends of these hairs are sharp and bayonet pointed (Fig. 4*a*). The cell forming the point is long. The septa are oblique and distinctly pitted and perforated, slightly overlapping on either side at the junction of two cells (Fig. 4*b*). The cells on either side of such a junction are empty and colourless, but occasionally they are thickened. The hairs are comparatively long, and consist generally of ten or twelve cells. The basal—one to three—cells are cork cells and are quite different from the others. They are smaller, have horizontal septa, are brown in colour and have a distinct granular content, a nucleus, and a thickened wall. The lowermost of the basal cells is the shortest, and the others are gradually longer until they merge into the empty, colourless cells (Fig. 4*d*). The whole structure of the hair is unique, and the presence of the perforated oblique plate-septa may, in a xerophytic herb like *Donatia*, possibly be for the purpose of water absorption. Among these hairs is found an epiphytic fungus to which I shall refer later.

LEAVES.—The leaves are packed closely round the stem, and are densely covered with the silvery grey hairs at the base, which is not narrowed into a petiole. The leaf changes in anatomical character from its base to its tip.

At the base, where it is attached to the stem, the leaf has an irregular triangular outline, with one vascular bundle in the centre (Fig. 6). The epidermis which bounds the leaf is formed of small, regular cells with a thick cuticle. A few stomata occur on the under surface, and these have no subsidiary cells, differing in this also from what is known of *Donatia magellanica*.† The mesophyll is not differentiated, the leaf being symmetrical, and consists of slightly-thickened cells, somewhat collapsed to the corners of the triangle. Owing to crushing, these cells are sometimes locally thickened and infolded, particularly at the corners, somewhat after the manner, though not to such an extent, as that of the infolded mesophyll of *Pinus sylvestris*. The vascular bundle is irregular in outline, with no bounding endodermis. The xylem

* Solereder, Systematische Anatomie der Dicotyledonen, p. 355.
† Ibid. p. 353.

in the centre of the bundle is well marked, as is the phloem which surrounds it. Mucilage cells are abundant.

Similar appearances to the foregoing are found from the base of the leaf to about the centre, where the single median nerve divides, giving off two side veins, and thus a section across the centre of the leaf shows three vascular bundles (Fig. 7). The leaf is now more symmetrical in shape, losing its triangular form and becoming somewhat oval. The cells of the mesophyll are large and regular. The bundles are similar to the median nerve in the basal section, but, on the outer side of each bundle, sclerenchyma is developed. Stomata are occasionally found, and mucilage cells are more abundant. As might be expected from the habit of growth, the tips of the leaves differ considerably in structure from the basal and central portions (Fig. 8). This is the exposed part of the leaf, and stomata are very abundant. Passing upwards to the tip of the leaf, the cuticle becomes lighter in colour and very thick, the mesophyll is differentiated into long, palisade cells under the epidermis and loosely-arranged cells towards the centre of the section, first occupied by three vascular bundles, but later by one, as the tip of the leaf is reached. There is a large amount of schlerenchyma developed on the outside of the bundle.

Fumago Donatiae, Chandler.

An Epiphytic Fungus occurring on *Donatia novae-zelandiae*, Hook. f.

Descr.—Effusa hyphis late racemosis; cellulis brevibus crassis; conidiis catenulatis, sphaericis v. sphaerico-cuboideis; hyphis fertilibus raris; sed crebro filamentis conjugatis.

Hab.—Inter pilos circa caulem *Donatiae novae-zelandiae.*

Intermingled with the hairs of *Donatia novae-zelandiae* is found the mycelium of a fungus. The fungus is epiphytic, for its mycelium merely twines in and out among the hairs of the stem, and lies on the epidermis, not actually piercing the tissue (Figs. 5 and 9). The filaments of the mycelium consist of thick-walled cells of an intense brown colour (Figs. 5 and 10), and they branch freely—the young branches being delicate and colourless. Bead-like gonidia are found on the mycelium (Fig. 10*a*). We know from De Bary * that a resting mycelium stage and resting gonidia are common in starved specimens of *Fumago*, *Penicillium*, and *Pleospora*. In this and other characters the fungus on *Donatia* resembles species of *Fumago*, the soot-fungus.

* De Bary, Comp. Morp. and Biol. of the Fungi, Mycetozoa, and Bacteria.

Under favourable conditions the mycelium and the gonidial cells pass from the condition of rest. After one day in water the mycelial threads swelled, and new transparent filaments were visible. After two days in water several of the gonidia had germinated, bursting the thick wall, giving rise to a promycelium.

Although *Fumago* is classed with the *Ascomycetes*, its life-history is not yet clear. Fertile hyphae are rarely seen, but in the species on *Donatia*, now under notice, twisted filaments, such as are found forming an ascocarp in *Penicillium*, were observed twice.

Conjugation of filaments, a feature that is not described in any one of the six species of *Fumago* mentioned by Saccardo,* is, however, common in the fungus on *Donatia* (Figs. 10 and 11). Two filaments may be seen lying parallel for the length of several cells, and a protuberance grows out from one cell only of one of the filaments until it reaches a cell of the parallel filament; it then fuses with it, and forms a distinct bridge between the filaments (Figs. 10*c*, 11*a*). The more common method of conjugation seems to be that a protuberance is formed simultaneously on two cells lying opposite on the parallel filaments, and these, growing out to each other, meet, and the bridge is thus formed by their union.

The variation is quite in accordance with Zopf's description of *Fumago*.† De Bary, too, cites this fungus as an example of a cycle of forms still more copious and various than that of *Pleospora* or *Nectria ditissima*.

* Saccardo, Syllogae Fungorum, iv, 547; xi, 638; xix, 1099.
† Zopf, Nova Acta Leopold, xl.

EXPLANATION OF PLATE LVIII.

Illustrating Miss Chandler's paper on "Donatia novae-zelandiae, Hook. f."

FIG. 1. Portion of cushion of *Donatia novae-zelandiae*. Nat. size.
FIG. 2. *a*. Flower of *Donatia novae-zelandiae*. (×3.)
b. Same showing stamens, corolla and calyx absent. (×3.)
FIG. 3. Transverse section of stem of *Donatia novae-zelandiae* (×140)—
a. Pith.
b. Xylem.
c. Phloem.
d. Cells of endodermis projecting towards one another.
e. Cortex.
f. Cork cells.
g. Septate hairs.
FIG. 4. Hairs on stem shewing (×280)—
a. An end cell.
b. Oblique septum, side view.
c. Oblique septum, front view.
d. Basal cells filled with granular contents.
FIG. 5. Epiphytic fungus among hairs of *Donatia novae-zelandiae* (×140)—
a. Hair.
b. Fungus.
FIG. 6. Transverse section of leaf at base. (×35.)
a. Infolding of cell-walls due to crushing.
b. Mucilage cells.
FIG. 7. Transverse section of leaf at centre. (×35.)
a. Mucilage cells.
FIG. 8. Transverse section of leaf near tip. (×35.)
a. Stomata.
b. Sclerenchyma.
FIG. 9. General view of epiphytic fungus among hairs. (×50.)
a. Hairs.
b. Fungus.
FIG. 10. Epiphytic fungus on *Donatia novae-zelandiae* (×200)—
a. Gonidial cells.
b. Young filaments.
c. Stages in conjugation of filaments.
FIG. 11. *a*. Filaments of fungus showing conjugation. (×275)
b. Hairs, oblique septum, side view.

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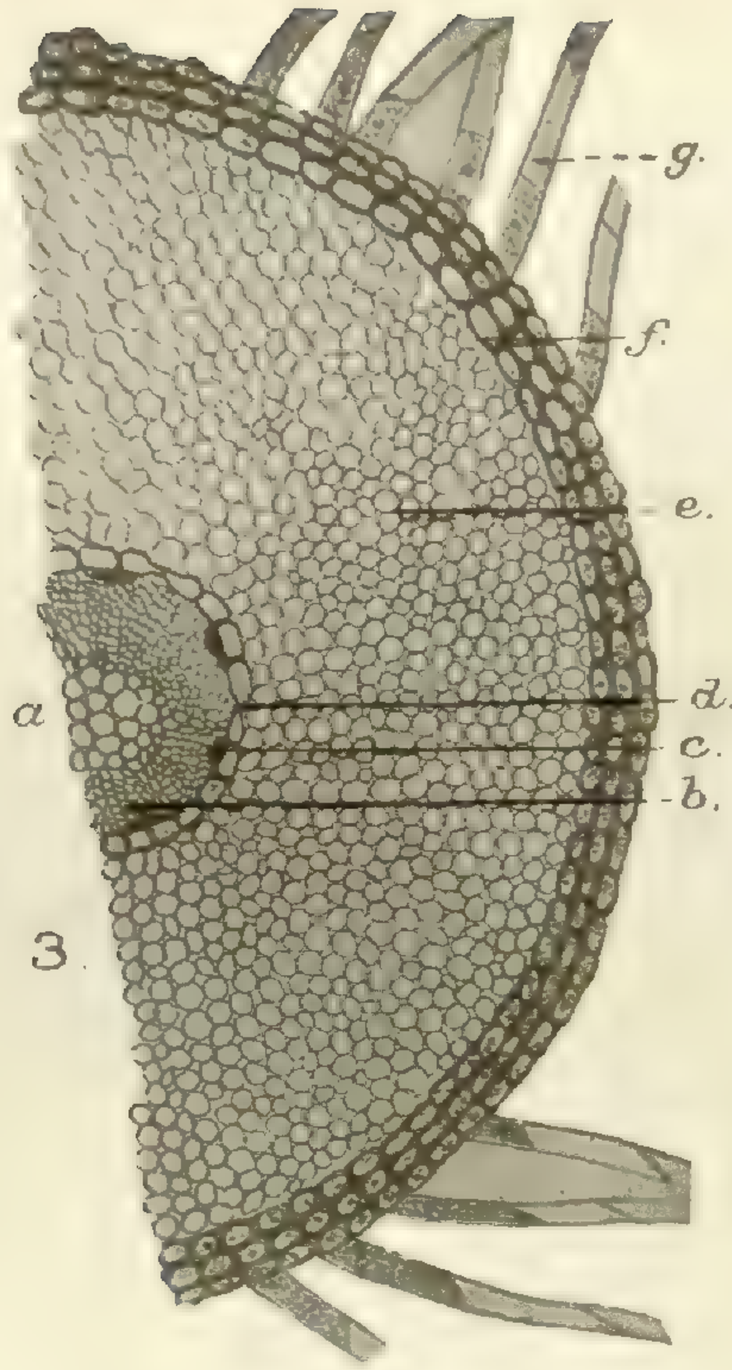

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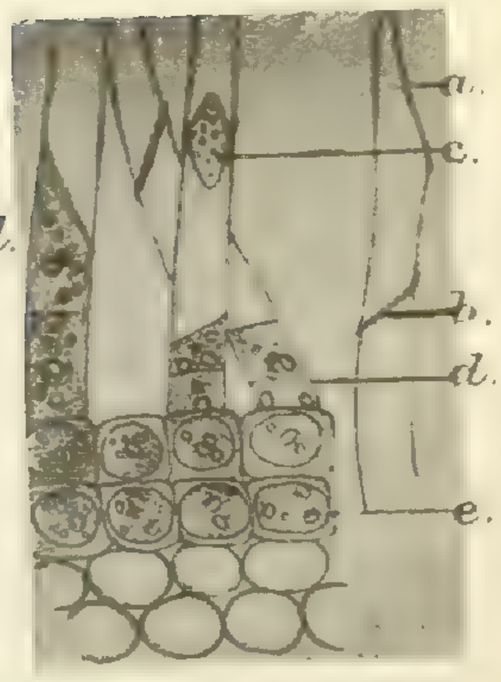

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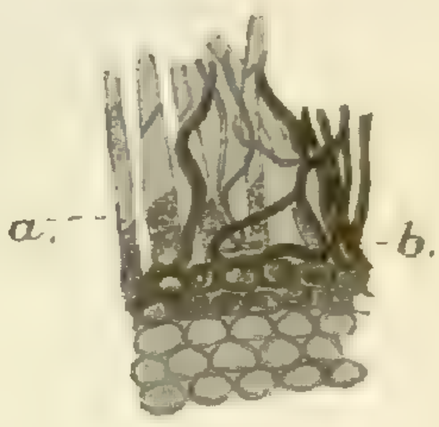

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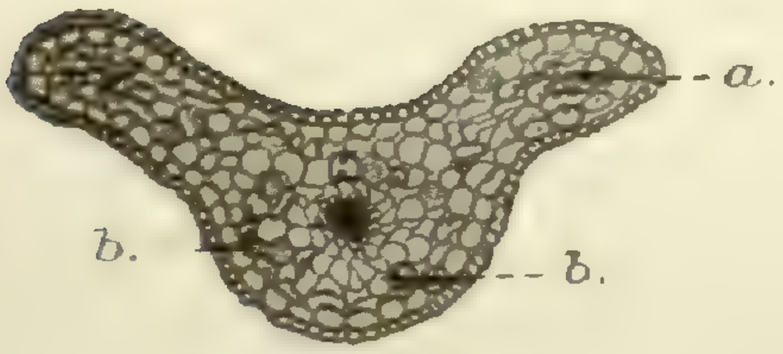

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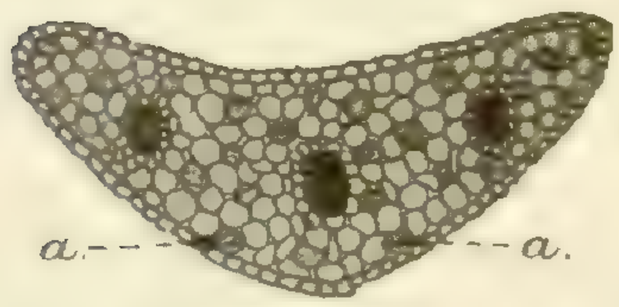

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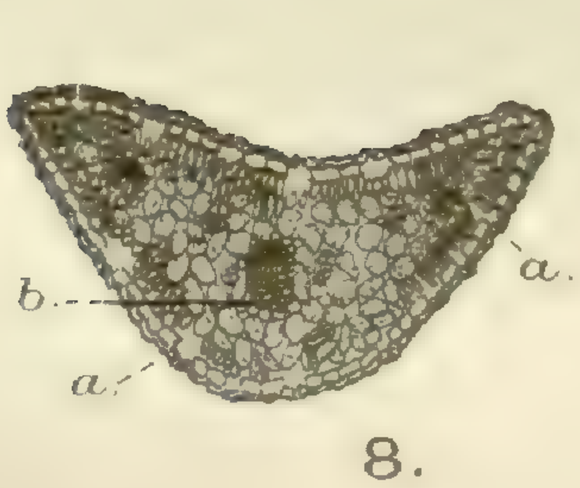

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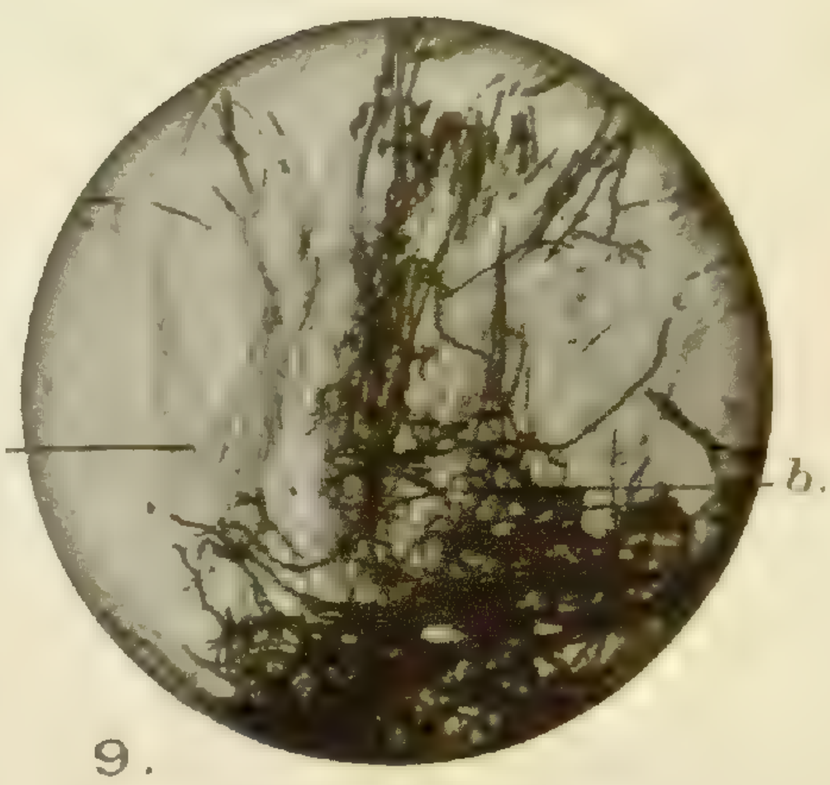

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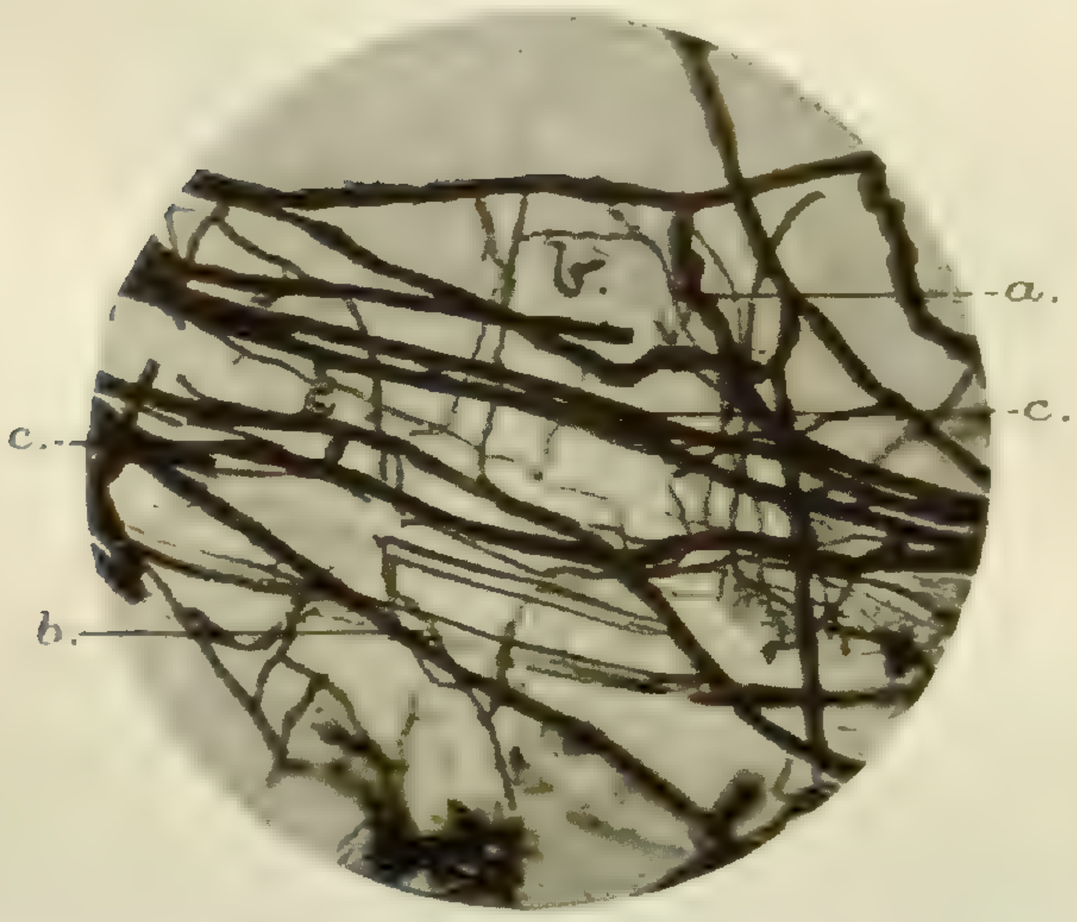

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Deherainia smaragdina, Dcne.

BY

BERTHA CHANDLER, M.A., B.Sc.

With Plate LIX.

DEHERAINIA SMARAGDINA was described in 1876 by Decaisne,* and the genus was named by him in honour of M. Pierre-Paul Deherain, aide-naturaliste of the Museum of the Jardin des Plantes. Later, in 1878, we have a description of the plant by Hooker † from a specimen growing at Kew. It thrives best as a stove plant, under warm, moist conditions, for the conditions of its native habitat, near Tabasco, Mexico, are damp and tropical. The particularly fine specimen—a symmetrical, well-formed shrub from 5–6 ft. in height—in the Royal Botanic Garden, Edinburgh, has afforded material for the following description :—

Deherainia smaragdina, of the order Theophrastaceae, is a much-branched, woody shrub, with twigs, leaves, and flower stalks covered with rusty-brown hairs. The leaves are simple, lanceolate, 2–5 in. in length, acute, alternate in arrangement, and crowded together at the apex of the branches in the form of a rosette (Fig. 1). They are deep-green in colour, and somewhat coriaceous in texture. On the upper surface the hairs are confined to the mid-rib, while the ventral surface is lighter coloured, and is wholly covered with red-brown hairs.

The petiole is comparatively short and also hairy. The flowers are characterised by their green colour, hence the specific name. They arise singly in the axils of the apical rosettes of leaves on a short pedicel, which does not bear prophylls. The calyx is pale-green in colour, hemispherical in shape, and five-partite; the lobes are imbricate, orbicular, coriaceous, membranous at the margins, which are also finely ciliated. The corolla (Fig. 2*a*, *c*) is from 2–2½ in. in diameter, rotate, five-partite; the lobes less rounded at the apex, and deeper green in colour than the sepals, finely veined, smooth, and coriaceous, pale and membranous at the margins, but not ciliated. The throat of the corolla is short, bluish-black in colour,

* Ann. Sc. Nat., sér. 6, tom. iii, p. 139.

† Bot. Mag. 1878.

and thickly covered with whitish hairs on the dorsal surface. Where the lobes of the corolla unite, occur small, ligulate projections, the so-called staminodes. These are five in number, sub-acuminate, and slightly paler green in colour than the petals (Fig. 2). The five stamens are opposite the petals; at first closely adpressed to the style (Fig. 2*a*, *b*), later they bend outwards, and place themselves against the corolla tube (Fig. 2*c*, *d*). The filaments are broad, and united at the base around the ovary; the anthers are sub-quadrate in shape and extrorse. The connective is obtuse, truncated; the pollen sacs are situated at the apex of the anther, and a white, mealy mass, consisting of cellular fibres, at the base. The ovary is flask-shaped, with a long, slender style and discoid stigma. It is unilocular, with numerous ovules borne on a central placenta.

SHOOT.—At the close of the flowering season, *Deherainia smaragdina* begins to put forth numbers of new shoots. These shoots, like the flower buds, arise in the axils of the apical leaves of the rosette. The various stages are shown in the figures (Fig. 3, I–V). The older leaves have been cut off, and their positions are indicated by the leaf scars. These new shoots are very soft, covered with a profusion of silvery-grey hairs, and a number of reddish scale leaves at intervals. In a later stage the leaf-buds have unfolded, and formed the same rosette that characterises the old shoot. The old stem is woody in character, covered with reddish-brown hairs, as indicated, and possessing but few scale leaves. As the young stem, therefore, begins to take on a woody character, its hairs become darker in colour, and the scale-leaves gradually wither away. This can be easily seen in (Fig. 3, V), where the scale-leaves of the older shoot are relatively small and insignificant to those on a younger stem.

The internal anatomy of the shoot is interesting. A transverse section (Fig. 4) of an old stem shows a large development of sclerenchyma outside the bundles. The cells of the pith are irregular in size, and are filled with starch. They have thick walls and are pitted. The intercellular spaces are small. The xylem is transversed by numerous medullary rays which are broad, and consist of thin cells elongated in the radial direction. A well-marked cambium occurs between the xylem and phloem. Outside the phloem are patches of sclerenchyma element rays with very small lumen. At the point where the medullary emerge the sclerenchymatic cells are larger, and the circular laminations are crossed by pits (Fig. 5*b*). The cortex, consisting of thin, regular cells filled with starch, is bounded by the epidermis. The cuticle is remarkably thick and corrugated on its surface (Fig. 5*a*); this is more clearly shown in a longitudinal section (Figs. 6, 7). From the epidermis unbranched hairs are given off.

In an old stem these hairs are very markedly thickened, and often swollen at the base (Fig. 6). In a young stem these hairs are replaced by numerous, stalked glands, the heads of which contain cells very similar to the glands which are found on the petals and leaves—though these latter are stalkless. Later on, in the development of the shoot, when the cuticle becomes thick and corrugated, the glands lose their heads, and become thickened to form an ordinary septate hair (Fig. 7).

A section of the young shoot agrees in appearance—except for the absence of the marked sclerenchyma—in all respects with a section of an older shoot.

LEAVES.—The structure of the leaves of the various representative genera of Theophrastaceae—*Clavija*, *Jacquinia*, *Theophrasta*—has been described already by Votch.* More recently he describes † also the leaf of *Deherainia smaragdina*, the plant under consideration. His examination gave the following results :—

"The epidermal cells are wavy in outline, and the cuticle is striated. Hypoderm is absent. The stomata are elliptical and do not project beyond the surface. Glands are present, with sixteen cells in the head. One-cell-rowed hairs to the length of ten cells are plentiful on the under side. The palisade parenchyma are only one-rowed, and consist of short cells. The subepidermal sclerenchyma are present only in single isolated groups on the upper side, but form large bundles on the under side. Crystals are present in the lower epidermis. The median nerve is simple, surrounded by sclerenchyma, which does not pass through it, and the phloem surrounds the xylem on three sides."

My examination of the leaf of *Deherainia smaragdina* confirms these observations generally (Figs. 8 and 9). I found, however, that very often the stomata do project considerably beyond the epidermis (Fig. 8*a*, 9*a*). The glands are stalkless, and are found on both sides of the leaf. The hairs, which are plentiful on the under side, are confined to the portion of the mid-rib on the upper.

A transverse section of the petiole, like that of the lamina, shows a large amount of sclerenchyma surrounding the median vascular system, which gradually splits up into three separate strands as the base of the petiole is reached.

ROOTS.—The root-structure of the Theophrastaceae has not been investigated as has that of the stem and leaf,‡ but that these organs might present points of interest equal to those already described, is shown by the structure of the root of *Deherainia smaragdina*.

A transverse section (Fig. 10) of a moderately old root shows

* Votch, Dissert. Erlangen, 1903. † Engler, xxxiii (1904), Bot. Jahrb.
‡ Votch, loc. cit.

xylem in the centre arranged in a somewhat spiral fashion from the centre. The cambium is succeeded by V-shaped patches of phloem, and a many-layered pericycle bounded by the endodermis, completes the central stele. The cortex is remarkable for the size, irregular arrangement, and localised division of its cells. The piliferous layer is formed of large cells, which divide in all directions.

The root hairs are remarkable for the thickness of their walls, especially at their base. If a section be cut somewhat obliquely across the base of one of these hairs, the thickness of the walls is at once remarked (Fig. 11*a*). In the young root, the cortical cells are more regular than in the old (Fig. 11).

FLOWER.—The external appearance of the flower-parts of *Deherainia smaragdina* has already been indicated, but one or two additional points may be noted. Typically 5-partite, 6-partite flowers are not uncommon, and, though themselves solitary on their stalks, they are usually developed in pairs in the centre of the rosette, one flower much in advance of the other. The contrast in colour shade between the sepals and petals is well seen in the bud. Not only is the throat of the corolla lined with hairs which slope downwards, but it is thickly dotted with glands visible to the naked eye, as black spots (Fig. 2*a*, *d*). These glands are also distributed, though not to such an extent on the upper portion of the petals. Hooker * has described these glands as "impressed dots on the upper surface." Otherwise they are unmentioned.

The internal structure of the flower has not been hitherto described, but offers many points of interest :—

The sepals, though simple in structure, show a well-marked epidermis on both sides, exhibiting a corrugated, cuticular layer on the outer wall. The cells composing the mesophyll are large and homogeneous ; the vascular bundles are numerous, and show distinct xylem and phloem. Glands are present, are on the interior surface, but not in any great number ; these sepaline glands, in contradistinction to those at the base of the petals, are all sessile and sunk to the level of the epidermis (Fig. 12*a*).

The petals on the other hand, in cross-section, show the glands more thickly distributed than on the sepals. They occur in all stages, and their development can easily be traced. They originate from an epidermal cell, which divides transversely ; the upper cell thus formed becomes the head, and the lower, which takes no further part in the development, remains unchanged. By a series of divisions the upper cell ultimately contains about sixteen cells situated in a radiate manner like the spokes of a wheel.

* Bot. Mag. 1878.

These glands are sunk in the corolla lobes ; their stalks consist of but one cell. In the throat of the corolla, however, at the base of the petals, these glands become more numerous ; the basal cell divides to form a stalk of from two to three cells, and the head of the gland is raised some distance above the epidermis (Fig. 13*a*). Interspersed with the glands are unicellular hairs at intervals (Fig. 13*b*).

The microscopical character of the stamen is perhaps the most interesting in the whole of the flower. The white mass to be seen on the upper side of the anther is shown under the microscope to be composed of particles of torn fibre, like torn, woody cells. The presence of this fibrous mass had already been remarked by Decaisne * in his description of the plant.

The pollen sacs are on the under side. The cells of the anther are undifferentiated, except in the region round the pollen sacs themselves, where they are slightly thickened. Between the sacs is an open space, comparatively large, which is filled with acicular crystals in crystal dust (Fig. 14*b*). What the purpose of these crystals are, it is difficult to determine. That they bear some relation to pollination and subsequent fertilisation is doubted, from their proximity to the pollen sacs. The crystals dissolved easily in HCl. The pollen grains are minute and round, and covered with a thick, brown exine, which is minutely fringed. The cuticle of the epidermal cells of the connective is also fringed in the same manner—in appearance like the minute crystal grains on the sporangium of *Mucor mucedo*. The question of the purpose of the crystals in the anther, those on the pollen grain and on the cuticle of the connective, and the presence of the fragmentary fibrous cells on the upper side of the anther, form a part of the larger problem of the fertilisation of the flower.

The ovary in section (Figs. 15 and 16) shows a central placenta on which are situated the anatropous ovules.

The seed and fruit are unknown in Europe, and wherever it has been naturalised. The plant is easily propagated by cuttings, roots being formed at the node without much callus formation.

It has already been stated that in the young stage of the flower, the stamens are closely adpressed to the stigma, but at a later stage they fly apart, and stand with their filaments and anthers pressed back against the petals. The full significance of this fact has not yet been grasped, for nothing is known yet as to the fertilisation of *Deherainia smaragdina*. That the flower is insect-pollinated is evident by its fœtid odour, by the presence of glands on the petals and the hairs lining the throat of the corolla. Various attempts were made to artificially fertilise the flower. Experiments were made by transferring the pollen grains

* Decaisne, in Ann. Sc. Nat., sér. 6, tom. iii.

from one flower in the young stage to the stigma of a flower in a correspondingly young stage; from one flower in a young stage to the stigma of another flower in an old stage, and otherwise. These experiments were, however, put an end to by the close of the flowering season. That the pollen is not sterile is proved by the fact that it germinated slightly in a weak solution of sugar (2 per cent.), also that a ripe seed was obtained, according to Mr. L. Stewart, Foreman of the Glass Department, Royal Botanic Garden, Edinburgh, when pollen was transferred from a *Dcherainia* plant to a *Theophrasta*. The microscopical character of the stamen is unique in many respects, and offers suggestions for experiments in artificial fertilisation, for which it is hoped there will again be opportunity. So far the pollen of *Dcherainia smaragdina* has shown itself for the fertilisation of its own species, practically sterile.

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EXPLANATION OF PLATE LIX.

Illustrating Miss Chandler's paper on "Deherainia smaragdina, Dcne."

FIG. 1. Shoot of *Deherainia smaragdina*. $\frac{1}{8}$ nat. size. Showing rosette of leaves and flowers.

FIG. 2. Flowers $\frac{1}{2}$ nat. size.
a. and *b*. Surface and side views of young stage.
c. and *d*. Surface and side views of older stage.

FIG. 3. Short various stages in development.
I and II. *a*. Rosette of young leaves.
b. Bud of new shoot.
c. Scar of old leaf.
III and IV. *a*. Bud of new shoot not yet expanded.
b. Scale-leaf.
c. Scar of old leaf.
d. Old leaf.
V. Later stage of development. The bud has expanded and we get the rosette of leaves similar to the old shoot.
VI. Photograph of same specimen. $\frac{1}{8}$ nat. size.

FIG. 4. Stem in transverse section. (×20.)

FIG. 5. Stem in transverse section. (×80.)
a. Cross-laminated scelerenchyma where medullary rays emerge
b. Thick corrugated cuticle.

FIG. 6. Stem showing thickened hairs on longitudinal section. (×100.)
a. Thickened hairs without swollen base.
b. The second cell above the surface of the epidermal cells beginning to divide.
c. Swollen cell above basal cell of thickened hair.
d. Cuticle beginning to thicken.
e. Thick and corrugated cuticle.

FIG. 7. Stem in longitudinal section. Young shoot arising in axil of old. (×30.)
a. Unthickened hairs, formerly glands.
b. Thickened hairs in axil of old shoot.
c. Thickened cuticle.

FIG. 8. Leaf in transverse section. (×60.)
a. Projecting stomata.

FIG. 9. Mid-rib of leaf in transverse section. (×20.)
a. Projecting stomata.
b. Hairs.

FIG. 10. Root in transverse section. (×25.)
a. Cortex.
b. Xylem.
c. Phloem.

FIG. 11. Young root in transverse section. (×20.)
a. Septate thickened hair.
b. Cortical cells.
c. Stelc.

FIG. 12. Petal and sepal in bud in transverse section. (×25.)
a. Stalkless glands on corolla lobe.
b. On sepal.

FIG. 13. Petal at base of corolla in transverse section. (×20.)
a. Stalked glands.
b. Septate hairs.

FIG. 14. Stamen in transverse section. (×90.)
a. Pollen-sacs filled with pollen grains.
b. Crystals.

FIG. 15. Ovary in longitudinal section. (×12.)
a. Central placenta bearing anatropous ovules.

FIG. 16. Bud showing ovary in cross-section. (×10.)
a. Stamen.
b. Anatropous ovules.
c. Transverse section of ligulate staminodes.

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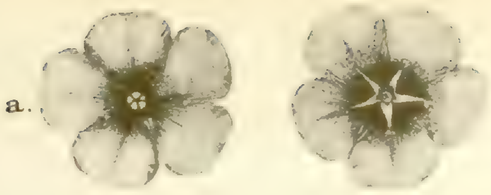

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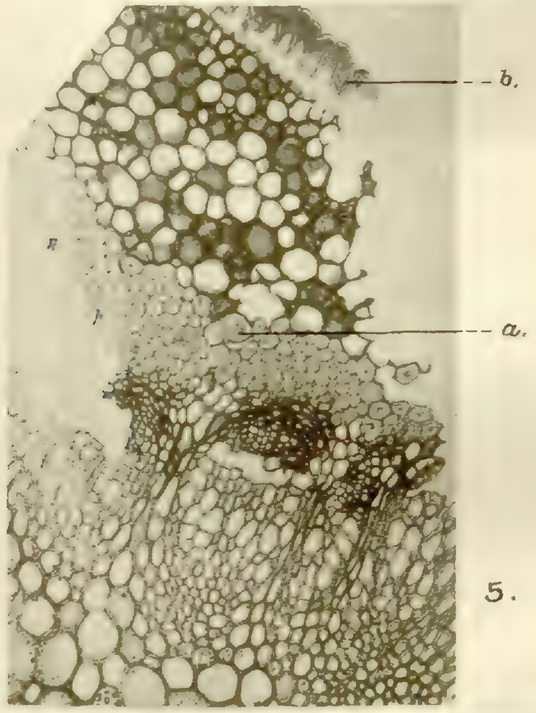

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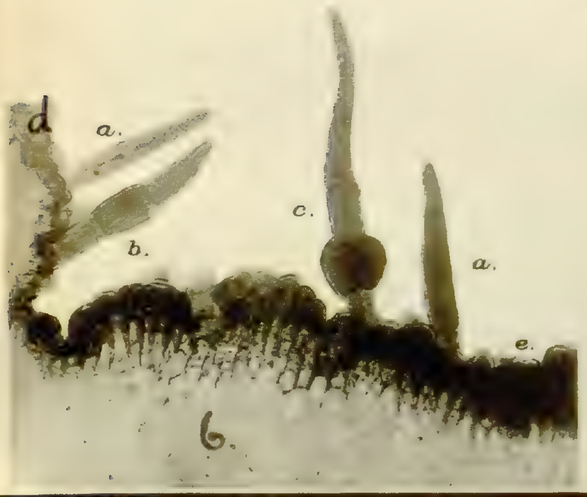

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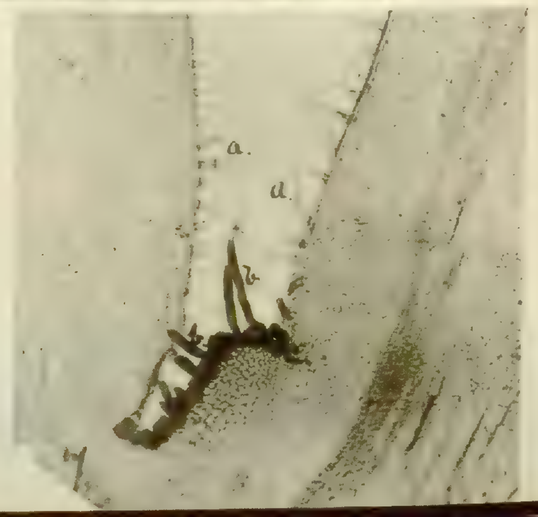

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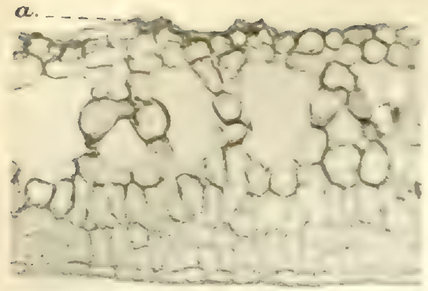

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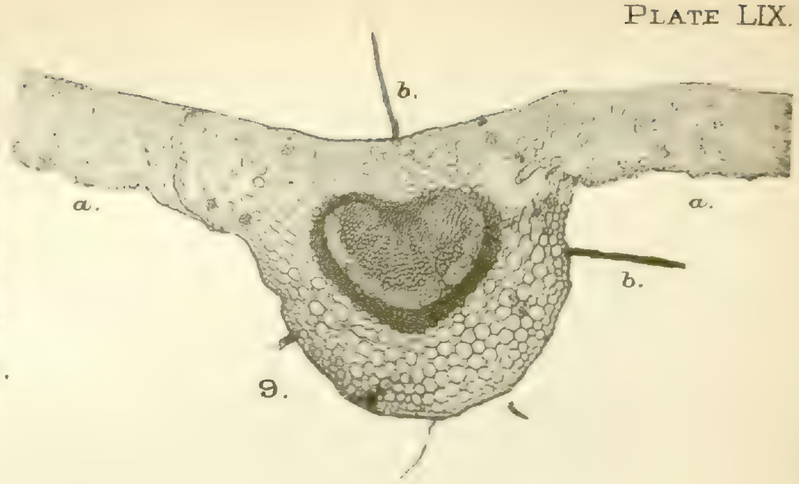

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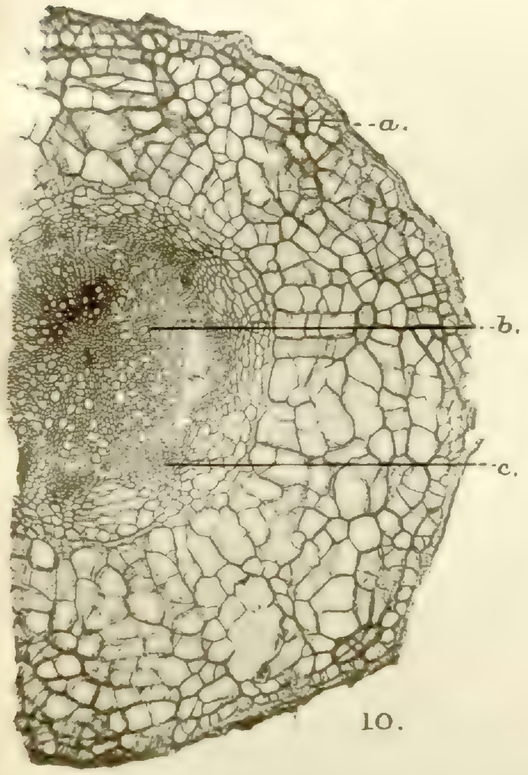

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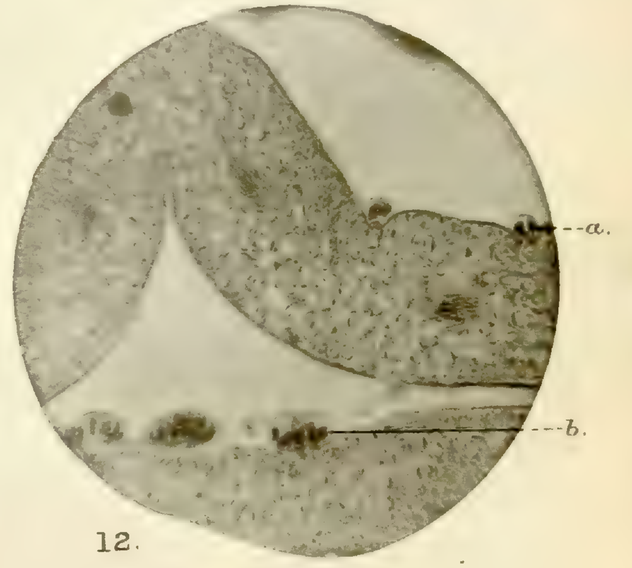

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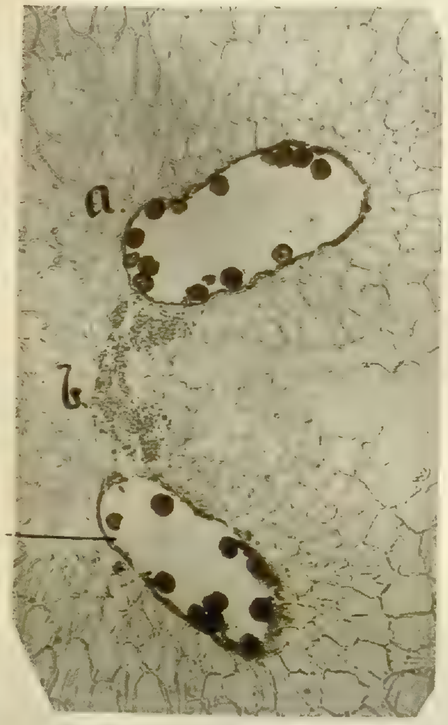

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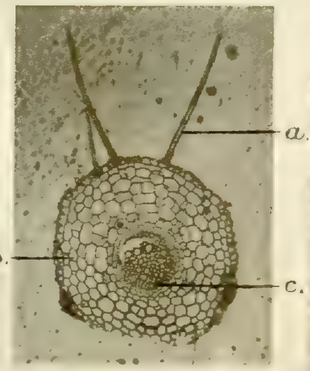

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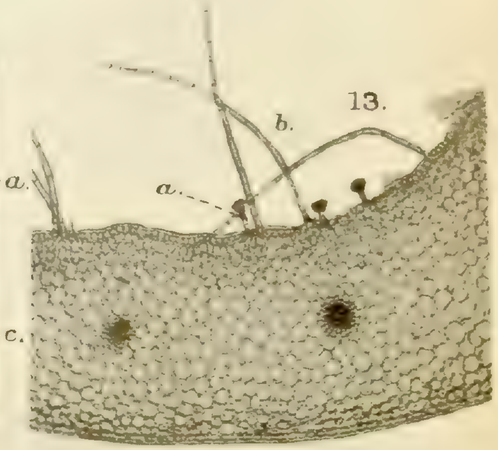

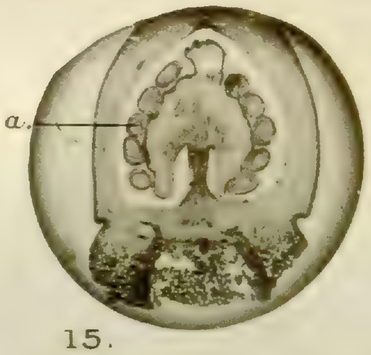

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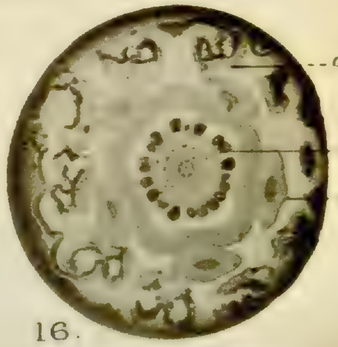

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lith. et coll.

SCHEUCHZERIA PALUSTRIS. LINN.

Scheuchzeria palustris, L. Its occurrence as a British plant, with a fresh record.

BY

GEORGE W. SCARTH, M.A.

With Plate LX.

SCHEUCHZERIA PALUSTRIS is associated with *Triglochin* in the family or tribe Juncagineae of the cohort Helobieae. It is the only species of the genus, and the genus is not particularly like any of its nearest allies. The species is, therefore, somewhat isolated, presumably an old and decadent type. Like many such it has a wide but rather sporadic distribution. Its range extends right round the northern hemisphere, viz., Western, Northern, and Central Europe, Siberia, and North America (Rocky Mountains, Labrador to Hudson's Bay, New Jersey to Wisconsin).

In Britain it has been recorded from about nine localities, some of them in close proximity. Our knowledge of it was summarised in 1904 by Mr. A. Bennet in the "Transactions of the Caradoc and Severn Valley Field Club." The history of the plant is briefly as follows :—

In *Yorkshire* it has been recorded from—

Leckby Car (*near Boroughbridge*).—It was discovered here in 1787 by the Rev. James Dalton, the earliest record for Britain. As late as 1892 Mr. J. G. Baker still recorded it. In 1903 Mr. Fisher wrote that it was extinct, and if there was any doubt as to the matter then, there is now none, for Leckby Car is drained and planted.

Thorne Moor (*near Doncaster*).—Discovered in 1832 by Mr. S. Appleby. One plant was found in 1870 ; it was sought in vain in 1877–1878 ; in 1890 a Moss Litter Company leased the moor and removed the peat, and Mr. Lees pronounced the plant undoubtedly extinct. A great fire in 1896, which destroyed 1000 acres of peat moss, made doubly sure of the fact.

Wetherby (*Mid-West Yorks*).—Mr. Bennet noted the following record in Don's *Herbarium Britannicum*, issued 1806, "Marsh near Wetherby, Rev. J. Dalton." There is no mention of this locality in Lee's West Yorkshire Flora, and no recent records.

[Notes R.B.G., Edin., No. XXII, November 1911.]

Malton (*E. Yorks*).—In the Herbarium at the Royal Botanic Garden, Edinburgh, there are specimens in herb. Col. Jas. Brodie, which he had received from the Rev. Jas. Dalton, and which are labelled apparently in Col. Brodie's own handwriting, "Found by Mr. Dalton, near Malton, Yorkshire." This seems definite enough, and neither Leckby Car nor any other recorded Yorkshire station can be described as near Malton in any sense of the word. Strange to say, however, there seems to be no other record for this locality, and, according to Mr. Bennet, "two or three good botanists have lived at Malton for many years"; nor is there any mention of Malton in Wilkinson's account of Dalton's herbarium in possession of the York Philosophical Society. This might be explained by the fact that these specimens were the last of Mr. Dalton's stock, as he states in a letter attached to the sheet, the rest having been supplied to Don for his Fasciculi. He may not again have gathered specimens at Malton, when Leckby Car was so much more convenient for him. At any rate, this is a rather problematical record. If it is authentic, we have no knowledge of the exact locality. Mr. Bennet suggests Terrington Car as the only place he can think of; but it can scarcely be supposed that the plant still exists and has escaped observation since Dalton's time.

For *Northampton* there is one old record. The Rev. M. J. Berkley wrote to Mr. H. C. Watson in 1844 that the plant had been found in a marsh (presumably Everton Car) in the North of Notts. There are no recent records to justify a hope that the plant may still exist there.

Shropshire has yielded four sites :—

Bomere.—Discovered, 1824, by Mr. J. Jeudwine. In 1881 Mr. Beckwith and Mr. La Touche could only find a few plants; in 1892 Mr. Druce, the Rev. E. F. Linton, and Mr T. P. Blunt could find none. It is assumed to be extinct.

Shomere.—Adjoining the above locality, where it is said to have been found the same year by the same gentleman. Mr Bennet could discover no records for the site.

Welshampton Moss.—In 1866 the Rev. O. M. Fieldon found three specimens here; in 1893 he could not find any, and in 1898 he wrote that he did not think he had seen it there within the last fifteen or twenty years.

Ellesmere.—Discovered in 1884 by Mr. Beckwith. In 1892 Rev. E. F. Linton could not find it there.

In *Cheshire* it was discovered on Wybunbury Bog, in 1849, by the Rev. G. Pinder. It was found in 1895 by the Rev. E. S. Marshall, though supposed to be extinct, and in 1904 the Rev. W. R. Linton told Mr. Bennet that he had seen it a few years previously, so that at that time there was still a hope that the plant survived

in that station. Recent search has caused botanists to fear that there too it has gone. The bog has been partly drained. In 1908 Mr. Druce and Mr. A. J. Evans spent two days at Wybunbury in a vain search for the plant, and again this year (1910) they spent a whole day looking for it without result.

In Scotland, *Scheuchzeria* used to be found in the White Myre of Methven, near Perth. It was discovered there in 1833 by Mr. Duff. Writing in the *Phytologist* in 1858, Mr. John Sim says that in June of that year he saw the *Scheuchzeria* growing luxuriantly and plentifully, and brought home "a good supply, above three hundred plants." In the next sentence he says "It is nearly done." Mr. Sim has been severely censured for this act of vandalism. In justice to him, however, it would appear that the "it is nearly done" refers to his "good supply," for he is offering plants for exchange, and, in a later paper, he says that the *Scheuchzeria* was still plentiful in August of the same year. However, the deed is not one which merits condonement, any the less that its author in the same paper expresses the pious opinion that "It is very ungracious of any botanist to root up any rare plant." He gathered it in 1874 for the last time. As it happened, these depredations did not matter very much, for other causes later made it impossible for the plant to survive there. A large colony of black-headed gulls settled in Methven Bog, and caused a rank growth of vegetation, to the detriment of smaller plants. Then, about 1880, to accommodate the gulls, the myre was flooded which would drown the plant if it still existed. It is only on dry summers that the place can be reached, yet it has been searched since then, but without result, in 1888, by Dr. Buchanan White and Mr. Barclay, and again about 1898 by Mr. Barclay and Mr. Meldrum. There are specimens from this locality in the Herbarium at the Royal Botanic Garden, Edinburgh, dated 1877, and this is probably about the latest date for the plant at this station.

Until this year *Scheuchzeria* has been found at no other station in Britain, and the evidence shows that it is lost and presumably extinct at all these stations. In July of this year, however, I discovered the plant on Rannoch Moor, in the Perth-Argyll area, so that it is still entitled to a place on the British list. It was growing there in fair quantity in a very wet, peaty marsh associated with *Carex limosa* and an intermingling of marsh and peat moor plants, a combination which appears to be characteristic of the habitat of *Scheuchzeria*, both in this country and in regions where it is more plentiful.

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Number XXIII.

NOTES

FROM THE

ROYAL BOTANIC GARDEN,

EDINBURGH.

DECEMBER 1911.

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Primula bellidifolia, King, and its Allies.

BY

S. T. DUNN, B.A., F.L.S., F.R.G.S.

With Plate LXI.

In the woods and damp alpine meadows of the eastern flanks of Tibet and adjacent ranges occur a number of species of a very marked section of the Primulas, having close heads or spikes of small blue or purple flowers, borne on long, slender scapes which arise from a rosette of entire or crenulate leaves.

Their fragrance and the fine colour of their flowers have frequently brought them under the notice of horticultural collectors, and, as a result, several species are now in cultivation in Europe. Their flowering under cultivation has invariably been in May, though in their wild habitats, so far as is known, their flowers are always produced during the latter part of July and August.

When Pax and Knuth published their monograph of *Primulaceae* in 1905, three species only of this group had been distinguished—*P. bellidifolia*, King, *P. cernua*, Franch., and *P. Viali*, Franch.; one more was described in that work—*P. Giraldiana*, Pax; four have been published since—*P. deflexa*, Duthie, *P. Littoniana*, Forrest, *P. muscarioides*, Hemsl., and *P. penduliflora*, Petitm.; while two more, *P. Watsoni*, Dunn, and *P. gracilenta*, Dunn, are added in the present paper founded on material in the Herbarium of the Royal Botanic Garden, Kew. *P. Watsoni*, Dunn, is represented at Kew by a living plant, communicated by Professor Balfour from the Royal Botanic Garden, Edinburgh, and it was his inquiry concerning it which led to the investigation of the group resulting in the following notes.

The ten species which are enumerated below, though having the appearance of being easily distinguishable, and being, in such cases as can be judged, quite distinct horticulturally, yet present some difficulty when it is attempted to arrange them in a systematic series. It may be that in some cases sexual forms, corresponding with the different relative positions of stigma and stamens well known to occur in this genus, have been

mistaken for nearly allied species. A careful study of this should be made when these species are better known in cultivation, in order to throw light upon the subject.

KEY TO THE SPECIES.

Calyx teeth acute	1. *Giraldiana.*
Calyx teeth obtuse	
Corolla lobes less than half the exserted part of the tube	
Corolla blue, lobes bilobed	2. *deflexa.*
Corolla dark purple, lobes obtuse or retuse	
Whole plant nearly glabrous, efarinose	3. *muscarioides.*
Leaves hairy, scape and inflorescence farinose	
Leaves repand-dentate, contracted into petiole	4. *bellidifolia.*
Leaves lobulate, sessile	5. *Watsoni.*
Corolla lobes more than half as long as the exserted part of the tube	
Corolla lobes obcordate	6. *penduliflora.*
Corolla segments ovate or oblong	
Leaves crenulate, spikes over 4 cm. long	
Spikes over 7 cm. long	7. *Littoniana.*
Spikes under 6 cm. long	8. *Viali.*
Leaves entire or coarsely lobulate, heads globose	
Leaves entire, broadly spathulate sessile	9. *cernua.*
Leaves rather coarsely lobulate oblong, narrowed into petiole	10. *gracilenta.*

1. **Primula Giraldiana,** Pax, in Engl. Pflanzenreich, Primul. (1905), fig. 27a.

A blue-flowered species of northern Shensi; geographically an outlier of the group's range and morphologically distinct from the other species by reason of its acute calyx teeth. There is no specimen at Kew.

2. **Primula deflexa,** Duthie. *Primula Viali,* Pax, quoad fig. 27c., in Engl. Pflanzenreich, Primul. (1905), 93.

3. **Primula muscarioides,** Hemsl., in Bot. Mag., t. 8168.

The flowers under cultivation are pale purplish-blue. The species is found in the portion of Yunnan lying north of the Yangtze Kiang. To Hemsley's original locality may be added Tsekou, Soulié, No. 1347, and Monberg.

4. **Primula bellidifolia,** King.

The plant, which has bluish-purple flowers and grows in Sikkim, seems never to have been cultivated.

5. **Primula Watsoni,** Dunn. Sp. nov. Plate lxi.

Herba perennis. Folia sessilia rosulata, oblanceolata, obtusa, basi longe attenuata, 7–15 cm. longa, praeter basin crebre regulariter lobulato-crenata, membranacea, in venis dense cetero sparse hirsuta, efarinosa. Scapus strictus, 10–30 cm. altus, glaber, apice farinosus, capitulum globosum vel spicam ovatam gerens. Flores sessiles, 8–12 mm. longi, bracteis lanceolatis 4 mm. longis. Calyx late campanulatus basi farinosus 2–3 mm. longus; dentes 5 paullo irregulares tubum aequantes, late ovati, margine ciliati. Corolla glabra atropurpurea; tubus cylindricus, 7–10 mm. longus, 1·5 mm. latus; limbus cupularis, 3–4 mm. latus; lobi 5, 2 mm. longi et lati, truncati vel retusi. Capsula ovalis, 4 mm. longa.

Probably all from the elevated woodlands among the high mountains round Ta-tsien-lu in W. Szechuen, Pratt, 252 (part), Soulié, 152, Wilson, 4036.

The species which has recently been introduced into cultivation has its deep purple flowers relieved by the bright yellow powdery coating of its scapes and inflorescence.

[The seeds were sent in 1908 to the Royal Botanic Garden, Edinburgh, by Mr. C. Watson, Solicitor, Annan, Dumfriesshire. They were collected by his son, Mr. Charles Marson Watson, after whom the species is named, at Ta-tsien-lu, at an elevation of 10,000 ft. The plant flowered at Edinburgh in summer of the year 1911, as did also *Primula deflexa*, Duthie, raised from seed received from the same source and at the same time.]

6. **Primula penduliflora,** Petitm., in Le Monde des Plantes, x (1908), 6.

Delavay, 3826. Not yet in cultivation, but in consequence of its large (for the group) deep purple flowers, probably one of the finest of the capitate Primulas.

7. **Primula Littoniana,** Forrest. Bot. Mag., t. 8341.

Forrest, 2655. Few new discoveries have received such immediate or such well-merited recognition. It is not five years since Forrest first saw it growing in moist alpine meadows in N.-W. Yunnan, and he not only secured excellent photographs of it upon the spot, but brought home dried specimens and seeds,

through which it is already well represented in many herbaria and gardens.

8. **Primula Viali,** Franch.

Yunnan. Delavay, 3604. *P. Littoniana,* Forrest, which appears to differ from the present species chiefly in robustness, may be a variety.

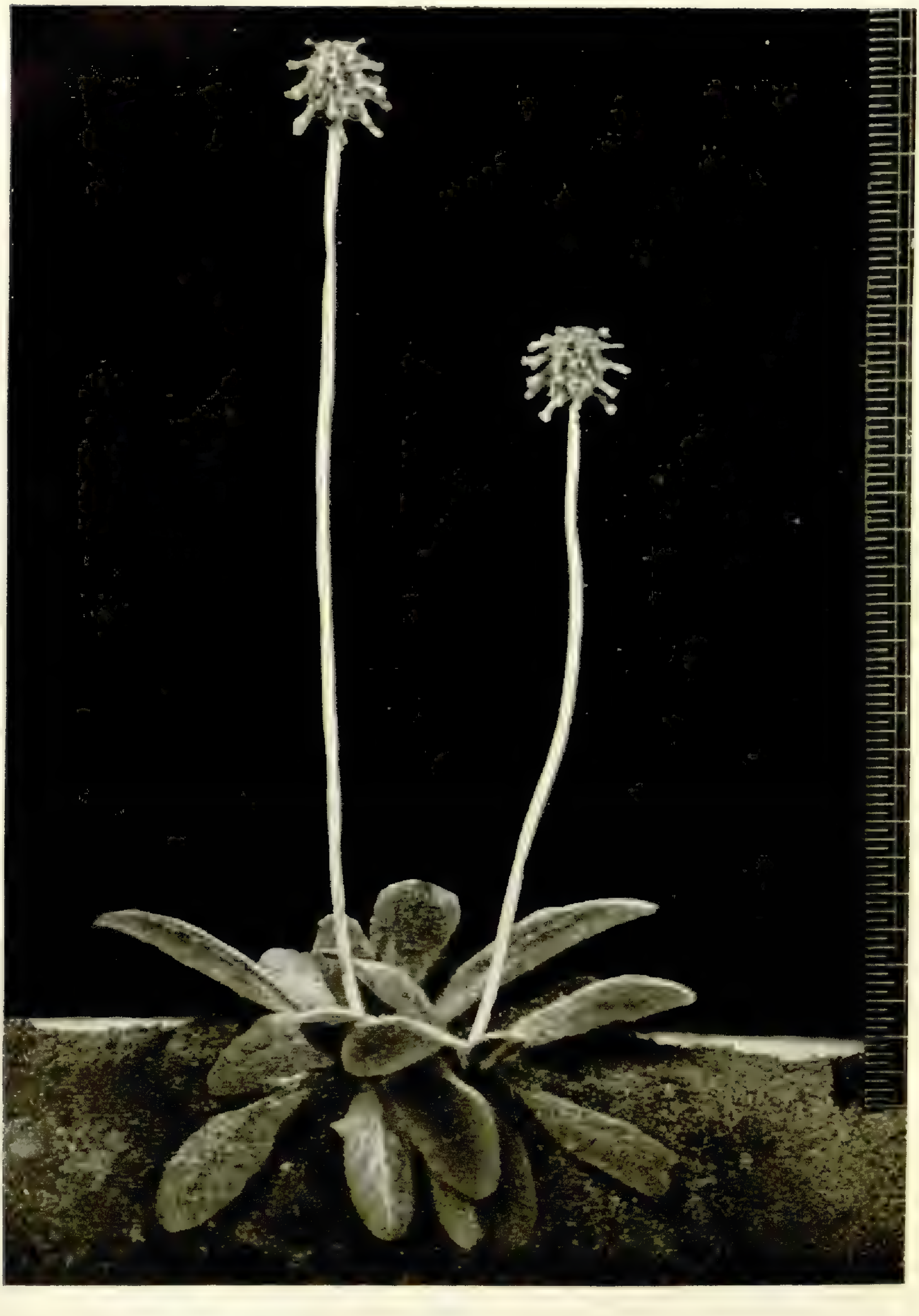
9. **Primula cernua,** Franch.

Yunnan. Delavay. Like the last, it is not at present in cultivation. It has only been found in one locality, and even there it is very rare.

10. **Primula gracilenta,** Dunn. Sp. nov.

Herba perennis, efarinosa. Folia petiolata, rosulata, oblonga, obtusa, basi in petiolis dimidio brevioribus angustata, 5–7 cm. longa, irregulariter dentata, membranacea, praecipue in venis laxe hirsuta. Scapus gracilis, 15–20 cm. altus, glaber, capitulum globosum gerens. Flores sessiles, 7–8 mm. longi, bracteis lanceolatis. Calyx late campanulatus, 2 mm. longus, dentes 5, tubum aequantes, ovati, margine sparse sed longe ciliati. Corolla purpurea; tubus cylindricus, 7–9 mm. longus, 1·5 mm. latus; lobi 5, oblongi, 2 mm. longi, quam 1 mm. angustiores, apice rotundati.

"W. Szechuen and Tibetan Frontier at 9000 to 13,500 ft." Pratt, 252 (part).



Primula Watsoni, *Dunn*.

Plantae Chinenses Forrestianae.

Plants discovered and collected by George Forrest during his first exploration of Yunnan and Tibet in the years 1904, 1905, and 1906.

Enumeration and Description of Species of Rosa.

BY

DR. W. O. FOCKE,
Bremen.

With Plate LXII.

Rosa Banksiae, R. Br., in Ait. Hort. Kew., ed. 2, iii, p. 258; Franchet, in Plant. Delav. (1889), p. 219.

f. **subinermis, fl. simpl.**

"South end of Lang Kong valley. Alt. 8000 ft." G. Forrest. No. 214.

A freely fruiting specimen, evidently wild.

"Shrub of 5–10 ft. Flowers white, fragrant. Open situations in thickets along the base of the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–9000 ft. June–July 1906." G. Forrest. No. 4443 ex pte.

f. **subinermis, fl. pleno v. semipleno albo.**

"Semi-scandent shrub of 10–20 ft. Flowers pure white, fragrant. Shady and open situations on and amongst trees and scrub in the Lichiang-fu valley. Lat. 27° 10′ N. Alt. 8200–10,000 ft. May 1906." G. Forrest. No. 2051.

f. **subinermis, fl. pleno luteo.**

"Spreading shrub of 6–8 ft. Flowers rich yellow, non-fragrant. Moist, shady situations in the Lichiang plain around the city. Lat. 26° 50′ N. Alt. 8200 ft. May 1906." G. Forrest. No. 2048.

f. **aculeata, fl. pleno albo.**

"Amongst scrub in open situations in the Lichiang valley. Lat. 27° N. Alt. 8–9000 ft. September 1904." G. Forrest. No. 155.

"Open situations in the Mekong valley above Teh Chih. Lat. 27° 30′ N. Alt. 8–9000 ft. September 1904." G. Forrest. No. 229.

f. **R. Banksiae verosimile hybrida.** *R. irridens*, form. nov., an *R. Banksiae* × *Soulieana* ?

Habitus *R. Banksiae*, ita ut specimina promiscue cum ea asservata sint.

Foliolorum rete venosum, sicut in *R. Banksiae*, valde conspicuum, nervi secundarii vero hoc rete percurrentes saepissime vix distinguendi sunt. Rhachis foliorum hinc inde aculeata; stipulae (saltem in foliis inferioribus) magna ex parte petiolo adnatae, pars libera lanceolata. Flores subumbellati. Bracteae lineari-lanceolatae, persistentes; pedunculi dense glandulosi. Styli in columnam teretem laxe villosam apice clavatam coaliti.

Folia et inflorescentia *R. Banksiae*; stipulae vero et stylorum columna plantam ad *Synstylorum* sectionem removent.

A very puzzling plant. An influence of *R. Soulieana* (or perhaps *R. moschata* ?) would account for the stipules, the prickles, and the styles, but the densely glandular peduncles can only be considered as a new character of the hybrid. In *R. Soulieana* and *R. moschata* the glands are scattered.

Gathered with the simple flowering *R. Banksiae* on the eastern flank of the Tali Range in 25° 40′ N. G. Forrest. No. 4443 ex pte.

Rosa centifolia, Linn.

Garden plant with a double flower. A small damaged branch. Tali-fu. G. Forrest. No. 4449 ex pte.

Rosa damascena, Mill.

f. **floribus simplicibus.**

"Semi-scandent shrub of 6–10 ft. Flowers rose-red, fragrant. Forming large clusters in shady, moist situations in the Lichiang valley around the city. Lat. 26° 50′ N. Alt. 8200 ft. May 1906." G. Forrest. No. 2053.

f. **floribus semiplenis.**

Doubtless escaped from gardens.

"Shrub of 6–10 ft. Clayey ground sides of streams and shady situations, Tali-fu. Alt. 6500 ft. December 1904." G. Forrest. No. 284.

"Shrub of 6–8 ft. Flowers lilac-rose. Shady situations amongst scrub around the city of Tali. Lat. 25° 40′ N. Alt. 6700 ft. June–July 1906." G. Forrest. No. 4449 max. ex pte.

"Erect shrub of 6–8 ft. Flowers dark crimson. Shady situations around Lichiang. Lat. 26° 50′ N. Alt. 8200 ft. May 1906." G. Forrest. No. 2052.

Somewhat different appears

f. **brachyacantha** (**simpliciflora**).

Prickles very short and small; flowers white, clustered.

"Shrub of 4–8 ft. Open situations around the city of Tali." G. Forrest. No. 4444.

Looks a little more like a wild plant, but, as it grows in the neighbourhood of the town, it will probably be of garden origin like all other forms of *R. damascena*.

7486 **Rosa Forrestii,** Focke. Plate lxii.

Sp. nov. vel. subsp. *R. microphyllae,* Roxb. *R. microphylla,* Crépin, Les Rosa de Yunnan, p. 10; Franchet, in Plant. Delav. (1889), p. 220.

Aculei ramorum gemini, validi, recti vel sursum inclinati. Folia in ramis fertilibus e foliolis 9 vel 11 composita; rhachis parce et minute aculeata; stipularum angustarum pars libera brevis, lanceolata; foliola late elliptica vel obovata, 2–2·5 cm. longa, 1·5–2 cm. lata, glabriuscula, dentato-serrulata, dentibus brevibus. Flores (in ramis suppetentibus) solitarii, conspicui, diam. fere 7 cm.; pedunculi inermes, eglandulosi; cupula cum sepalorum parte media densissime setoso-aculeata; sepala margine dilatato tomentoso-cincta, externa appendicibus foliaceis viridibus magnis multifidis lateralibus instructa; petala magna, pallide rosea vel alba; stamina numerosissima; stigmata in capitulum conferta.

In *R. microphylla* carpella fundo solum urceoli inserta et fructus maturi cum pedunculis decidui sunt. *R. Forrestii* verosimile his signis, quae in omnibus aliis Rosis desiderantur, cum *R. microphylla* convenit. Haec species differt foliolorum numero

majore (13 vel 15), foliolis angustioribus (2 : 1 vel 2·5 : 1·2 cm.), pedunculis aculeatis, floribus vulgo minoribus, sepalorum appendicibus latioribus, parcius incisis.

Habitu *R. Forrestii* species distincta videtur, sed forte formae intermediae eam cum *R. microphylla* conjungendam esse suadebunt.

"Shrub of 2–4 ft. Flowers pale rose or white. Dry, stony situations along the base of the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–8000 ft. June 1906." G. Forrest. No. 4450.

Rosa gigantea, Collett, in Journ. Linn. Soc. xxviii, p. 55, pl. ix.

f. **erubescens,** Focke.

Differt a planta typica floribus paullo minoribus (diam. fere 10 cm.) roseis (nec albis). Folia, supremo ternato excepto, quinata vel singula septenata; flores solitarii, odorati; sepala longa, integra, in flore reflexa.

"Semi-scandent shrub of 10–20 ft. Flowers rose pink, fragrant. Shady situations in the Lang Kong, Hoching, and Lichiang valleys; specimens from the Lichiang valley. Lat. 26° 50′ N. Alt. 8200 ft. May 1906." G. Forrest. No. 2049.

"Shrub of 2–6 ft. Flowers rose, fragrant. Open, moist situations amongst scrub in the Tali valley. Lat. 25° 40′ N. Alt. 6700–8000 ft. May–June 1906." G. Forrest. No. 4446.

"Shrub of 4–8 ft. Flowers rose-pink, fragrant. Moist, open situations amongst dwarf scrub in the Tali valley. Lat. 25° 40′ N. Alt. 6700–8000 ft. May 1906." G. Forrest. No. 4452

Crépin does not mention the *R. gigantea* or an allied plant from Yunnan.

Rosa macrophylla, Lindl., Ros. Monogr., p. 35, t. 6; Franchet, in Plant. Delav. (1889), p. 219.

f. **robusta.**

"Shrub of 6–10 ft. Flowers various shades of rose, according to situation. Fruit large, $\frac{1}{2} \times \frac{3}{4}$ in., bright scarlet, glabrous, calyx persistent. Shady thickets and pine forests on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 10–11,000 ft. June 1906." G. Forrest. No. 2504.

f. **parce glandulosa.**

"Branching shrub of 5–8 ft. Flowers bright rose, non-fragrant. Fruit bright scarlet, glabrous, long-shaped, calyx persistent. Very shady situations in a deep side valley on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10–11,000 ft. June 1906." G. Forrest. No. 2402.

f. **gracilis.**

"Shrub of 4–6 ft. Flowers bright rose, non-fragrant. Open situations in thickets at the base of the eastern flank of the Lichiang Range. Lat. 27° 10′ N. Alt. 8000 ft. June 1906." G. Forrest. No. 2336.

"Shrub of 3–5 ft. Flowers crimson. Open, stony situations in the Tali valley, and on the base of the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 6700–8000 ft. June 1906." G. Forrest. No. 4442.

"Shrub of 4–6 ft. Flowers pale rose. Open, stony ground in the Tali valley. Lat. 25° 40′ N. Alt. 6700 ft. May–June 1906." G. Forrest. No. 4445.

"Shrub of 3–6 ft. Flowers pale rose, fragrant. Shady situations by streams in the Tali valley. Lat. 25° 40′ N. Alt. 6700 ft. June–July 1906." G. Forrest. No. 4447.

"Shrub of 6–8 ft. Flowers pink. Amongst scrub on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–8000 ft. June 1906." G. Forrest. No. 4453.

Rosa moschata, Mill., var. **yunnanensis,** Crépin ex Franchet, in Plant. Delav. (1889), p. 218.

"Semi-scandent spinous shrub of 5–10 ft. Branches arched. Flowers white, fragrant. In shady situations on the banks of a stream on the plain at the north end of the Mechi-chiang valley. Lat. 27° 10′ N. Alt. 10,000 ft. June 1906." G. Forrest. No. 2370.

Rosa sericea, Lindl., Ros. Monogr., p. 105, tab. 12; Franchet, in Plant. Delav. (1889), p. 220.

7247 f. **inermis eglandulosa.**

"Shrub of 2–6 ft. Flowers white, strongly fragrant. Stony, open situations amongst scrub on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. May–June 1906." G. Forrest. No. 4451.

f. **aculeata eglandulosa.**

"Spreading shrub of 3–9 ft. Flowers yellowish-white, fragrant. Mountain meadows and on the edges of pine forests on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 9500–11,000 ft. June 1906." G. Forrest. No. 2256.

"Shrub of 4–8 ft. Flowers white. Amongst scrub in side valleys on the eastern flank of the Tali valley. Lat. 25° 40′ N. Alt. 8–9000 ft. June-July 1906." G. Forrest. No. 4448.

"Dwarf shrub of 2–4 ft. Flowers creamy white, fragrant. Amongst scrub in open, dry situations in the Sung Kwei, Hoching, and Lichiang valleys. Specimens from north end of Hoching valley. Lat. 26° 40′ N. Alt. 8–9000 ft. April 1906." G. Forrest. No. 2022.

Some of the prickles very broad.

f. **pteracantha,** Franchet, in Plant. Delav. (1889), p. 220.

"Shrub of 6–10 ft. Flowers white. On the ascent of the Niu Chang pass from the Yangtze valley to the Chung Tien plateau. Lat. 27° 50′ N. Alt. 11,000 ft. September 1904." G. Forrest. No. 219.

Sterile branch.

Rosa Soulieana, Crép.

"Shrub of 4–8 ft. Flowers white. Moist situations by the sides of streams in the Tali valley. Lat. 25° 40′ N. Alt. 6700 ft. July–August 1906." G. Forrest. No. 4454.

Rosa Forrestii, *Focke.*

Plantae Chinenses Forrestianae.

Plants discovered and collected by George Forrest during his first exploration of Yunnan and Eastern Tibet in the years 1904, 1905, and 1906.

Enumeration and Description of Species of Rubus.

BY

DR. W. O. FOCKE,
Bremen.

With Plates LXIII.–LXIX.

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1. **Rubus loropetalus,** Franchet, in Plant. Delav. (1889), p. 203.

"Creeping shrubby plant of 3–4 inches. Flowers pure white. In dense, shady pine forests on the eastern flank of the Lichiang Range. Lat. 27° 18′. Alt. 10–12,000 ft. June 1906." G. Forrest. No. 2330.

"Plant of 2–6 inches. Stoloniferous. Flowers white. Shady pine forests on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 10–12,000 ft. July–September 1906." G. Forrest. No. 4403.

Franchet distinguishes this species from *R. Fockeanus*, Kurz, by its narrow petals and by a somewhat different shape of the sepals. It seems doubtful, however, whether the two species can be kept distinct.

2. **Rubus lineatus,** Reinw. f., **angustifolia,** Hook f., in Flor. Brit. Ind. ii. (1879), p. 333.

Petioli 2–3 cm. longi, foliola 12 cm. longa, 3 cm. lata, subtus albo-sericea.

"Spreading shrub of 6–10 ft. Flowers white. Damp, shady situations in the Ku-tan-ho valley, Salwin valley, Salwin Irawaddy divide. Lat. 26° 30′. Alt. 9000 ft. September 1904." G. Forrest. No. 1046.

3. **Rubus paniculatus,** Sm., in Rees' Cyclop. xxx, Rubus, p. 41.

"Shrub of 6–12 ft. Flowers yellowish-white. Rocky situations in thickets on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 9–10,000 ft. August 1906." G. Forrest. No. 4399.

4. **Rubus major,** Focke. Sp. nov. Plate lxiii.

R. multibracteato similis, sed multo major.

Frutex elatus, subscandens, ad 3–5 m. altus. Rami fertiles teretiusculi, cum petiolis dense villoso-tomentosi et hinc inde recurvo-aculeati; stipulae liberae (caulinae), magnae, latae, irregulariter incisae. Petioli ca. 6 cm. longi; folia ambitu subrotunda, diam. ca. 12 cm., basi profunde cordato-incisa, palmato-7-nervia, toto margine fere 15-lobulata, lobis acutis, inaequaliter argute dentata, supra pustulato-rugosa, subtus nervis prominulis reticulata, molliter cano-villosa. Inflorescentia e floribus paucis magnis et axillaribus et bracteatis composita; pedunculi tomentosi, ad 3 cm. longi. Flores expansi fere diam. 5 cm.; calyx externe cano-tomentosus, sepalis ovato-oblongis, inaequaliter appendiculato-mucronatis, post anthesin patentibus. Petala, ut videtur, elliptica, sepalis paullo breviora, post anthesin marcescentia, sordide albida; filamenta complanata, pilosa; styli filiformes stamina superantes. Gynophorum, post fructum carptum, elongato-conicum (ca. 1 cm. longum), glabriusculum, stipite crasso villoso elevatum; discus glaber.

"Plant of 10–20 ft. Semi-climber. Flowers dirty white. Shady woods on the Mekong Yong-chiang divide Teng-yueh-Talifu-road. Lat. 25° 15′. Alt. 7–9000 ft. September 1903." G. Forrest. No. 916.

5. **Rubus polytrichus,** Franch. (nec Progel), in Plant. Delav., p. 204.

R. Chaffanjoni, Léveillé et Van. seems to be not different.

"Prostrate shrub of 1–3 ft. Flowers pure white. Shady situations in rhododendron scrub on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 8–10,000 ft. August–October 1906." G. Forrest. No. 4400.

6. **Rubus hypopitys,** Focke. Sp. nov. Plate lxiv.

Ex affinitate *R. pacifici,* Hance.

Humilis et, teste collectore, semi-procumbens. Radix lignosa caudice incrassato coronata. Caulis fertilis e caudice

enatus, simplex, erectus, cum petiolis canescenti-tomentosus et aculeolis minutis instructus. Stipulae liberae, profunde fissae. Folia sat longe (ca. 4 cm.) petiolata, malvacea, sinu lato aperto cordata, vix longiora quam lata, triloba vel incisurâ superficiali loborum lateralium subquinqueloba, lobis non lobulatis obtusis crenato-dentatis; terminalis fere semiorbicularis, supra parce, subtus densius pilosus. Flores in specimine suppetente duo approximati, terminales majusculi (diam. fere 3 cm.); sepala externa apicem versus irregulariter incisa; styli filiformes, stamina superantes. Gynophorum globosum, hirsutum, post fructum maturum carptum stipite longo piloso elevatum persistens.

"Semi-procumbent plant of 1–2 ft. Damp, shady situations in pine woods. Western slope of the Mekong valley on the Teng-yueh-Talifu-road. Lat. 25° 15′. Alt. 8–9000 ft. September 1906." G. Forrest. No. 1908.

7. **Rubus sp.**—

R. corchorifolio, Linn. f., affinis. an *R. otophorus*, Franch., in Plant. Delav. (1889), p. 204?

Specimen imperfectum.

"Shrub of 2–3 ft. Flowers white. Amongst scrub on the western slope of the Mekong valley. Lat. 25° 15′. Alt. 6000 ft. April 1906." G. Forrest. No. 5021.

8. **Rubus Delavayi,** Franch., in Plant. Delav. (1889), p. 205.

"In pine forests on the divide between the Hoching and the Lichiang valleys. Lat. 26° 45′. Alt. 8–10,000 ft. August 1906." G. Forrest. No. 129.

9. **Rubus lutescens,** Franch., in Plant. Delav. (1889), p. 206.

"Small shrub of 9–12 inches. Flowers pale canary yellow. Grassy openings in rhododendron forest on the eastern flank of the Lichiang Range. Lat. 27° 18′. Alt. 10–11,000 ft." G. Forrest. No. 2329.

10. **Rubus pungens,** Cambess., in Jacquem. Voy., Bot., p. 48, t. 59.

"Shrub of 4–8 ft. Flowers white. Open, rocky situations in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. July–August 1906." G. Forrest. No. 4401.

"Shrub of 3–6 ft. Open situations amongst scrub on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 10–11,000 ft. August–September, 1906." G. Forrest. No. 4404.

11. **Rubus stimulans,** Focke. Sp. nov. Plate lxv.

Frutex 1–2 m. altus; suppetunt duo rami florentes, quorum unusquisque folia perfecta 4 cum uno floribus immixto minore et flores 5 fert. Aculei compressi longi et glandulae stipitatae breves copiose in ramo, petiolis pedunculis calycibusque obvii. Rami subangulati, 20–23 cm. longi, cum petiolis pedunculisque pubescentes; folia pinnato-quinata, cum petiolis ca. 8–12 cm. longi; petioli supra late sulcati; stipulae petiolares, lineares vel lineari-lanceolatae; foliola tenuia, approximata, inaequaliter grosse et argute serrata vel subincisa, supra breviter pilosa, subtus appresse cano-tomentosa et in nervis aciculata; terminale e basi saepe truncatâ vel emarginatâ ovatum acuminatum, ca. 5 cm. longum, 4 cm. latum; lateralia sessilia, oblique ovata, acuta. Flores 2–3 in apice rami conferti et 2-3 magis distantes axillares, nutantes, expansi diam. fere 3 cm. (praeter aristas sepalorum), in statu juvenili fere campanulati; cupula pelviformis, sepala ovato-lanceolata, mucronata vel aristata, externe cano-tomentella et aciculata. Petala obovata, sepalis (aristâ exceptâ) fere aequilonga, alba. Stamina fere uniseriata, filamentis inferne paullulum compressis. Carpella numerosa, glabra, stylis filiformibus.

"Shrub of 4–8 ft. Flowers white. Amongst scrub in thickets on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 8–10,000 ft. June–July 1906." G. Forrest. No. 4398.

12. **Rubus trijugus,** Focke. Sp. nov. Plate lxvi.

Rami vetusti arcuati, teretes, glabri, inermes, spadicei, nitentes. Rami floriferi usque ad apicem foliosi, floribus paucis terminati, puberuli, aculeis parvis sparsis instructi, 10–12 cm. longi; folia plurima septenato-pinnata (in singulis foliola 5 vel 9), cum petiolis 12–18 cm. longa; petioli pubescentes, aculeis falcatis armati, supra sulcati; stipulae breves, subulatae; foliola membranacea, inaequaliter grosse serrata et subincisa, supra strigoso-pilosa, subtus cano-tomentosa; terminale paullo, majus, ca. 5·0 cm. longum, 3·5 cm. latum, ovatum, acuminatum, lateralia subsessilia, oblique ovata, acuta. Flores 3–4, insertioni folii supremi approximati, expansi diam. fere 2 cm., unicus interdum ad axillam folii penultimi. Pedunculi fere 1 cm. longi, pubescentes, inermes; calyx cano-virescens, inermis, cupulâ pelvi-formi, sepalis triangulari-lanceolatis, in flore patentibus;

petala elliptica, unguiculata, suberecta, sepalis paullo longiora, alba.

"Shrub of 3–6 ft. Branches arched, spinous. Main stem smooth. Flowers white. Grassy openings in mixed forests on the eastern flank of the Lichiang Range. Lat. 27° 10′. Alt. 9–10,000 ft. June 1906." G. Forrest. No. 2303.

13. **Rubus biflorus,** Hamilt. Franch., in Plant. Delav. (1889), p. 207.

"Spinous shrub of 4–8 ft. Branches arched. Flowers white. Fruit large, yellow, edible. Open, shady situations on margins of pine forests on the eastern flank of the Lichiang Range. Lat. 27° 20′. Alt. 11,000 ft. June 1906." G. Forrest. No. 2453.

In hac plantâ interdum aciculi pauci in calycibus occurrunt.

f. **parce glanduligera.**

"Shrub of 3–6 ft. Flowers white. Dry, shady situations in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 12′. Alt. 10–11,000 ft. May 1906." G. Forrest. No. 2123.

14. **Rubus alexeterius,** Focke. Sp. nov. Plate lxvii.

Frutex 1–2 m. altus, ramis arcuatis. Rami vetusti teretes, glabri, aculeis validis e basi latâ anguste lanceolatis deflexis armati. Rami fertiles breves, usque ad pedunculum terminalem fere 3 cm. longi, villosi, aculeis subulatis vel aciculis armati, folia 2–4 ferentes. Folia ternata, supremum saepe simplex et profunde trifidum; petioli villosi, parce aciculati; stipulae breves, subulatae; foliola parva, grosse et in parte anteriore inciso-serrata, supra pilosa, subtus cano-tomentosa; terminale breviter (0·5–1·0 cm.) petiolulatum, rhombeum, acutum, 4–5 cm. longum, 2·0–3·5 cm. latum; lateralia sessilia, oblique oblonga. Flores 1–4, praeter terminalem singuli axillares, inflorescentiam laxam paucifloram efformantes; pedunculi stricti, villosi, crebre aciculati, 1–3 cm. longi; calyx vulgo clausus, elongatus, ad 2 cm. longus; cupula pelviformis, praecipue fundo densissime aciculata; sepala inaequalia, subfoliacea, lanceolata, parce aciculata, apicem versus laevia, sub anthero, ut videtur, per breve tempus patentia, mox erecta, conniventia et fructum immaturum arcte involucrantia. Petala lata, verosimile subrotunda, sepalis breviora, alba. Fructus (teste Forrest) magni, lutei, edules.

"Spinous shrub of 4–7 ft. Branches arched. Flowers white. Fruit large, yellow, edible. Shady, rocky situations in pine

forests on the eastern flank of the Lichiang Range. Lat. 27° 20′. Alt. 11,000 ft. June 1906." G. Forrest. No. 2452.

15. **Rubus stans,** Focke. Sp. nov. Plate lxviii.

Caules (turiones) vetusti erecti, ca. 1 m. alti, copiose pilosi glandulosique, aculeis validis lanceolatis patentibus (nonnullis interdum sursum inclinatis) armati. Rami, fertiles erecto-patentes, fere 5 cm. longi, dense villosi glandulosique, aculeati, folia conferta ferentes. Folia breviter (0·5–1·5 cm.) petiolata, ternata; petioli petiolulique villosi, glandulosi, aculeati; stipulae lineares; foliola lata, suborbicularia (diam. fere 2 cm.), grosse crenato-dentata, glanduloso-ciliata, supra dense pilosa, subtus nervis prominentibus rugosula, villosa, glandulosa, virentia; terminale breviter (0·5 cm.) lateralia vix petiolulata. Flores pauci terminales, breviter pedicellati, et praeterea saepe unicus distans, axillaris; omnes nutantes, expansi diam. ca. 2 cm., calyx villosus, glandulosus, inermis, cupulâ pelviformi, sepalis lanceolatis fusco-purpurascentibus, post anthesin patentibus; petala, ut videtur, late elliptica, purpurea; stamina uniseriata, erecta, post anthesin conniventia, filamentis inferne compressis.

"Erect plant of 3–4 ft. Flowers rose red. Open, stony situations amongst scrub on the eastern flank of the Lichiang Range. Lat. 27° 10′. Alt. 10–11,000 ft. May 1906." G. Forrest. No. 2286.

16. **Rubus micranthus,** D. Don. Prodr., p. 235.

"Spreading spinous shrub of 6–8 ft. Branches arched. Flowers magenta rose. Open, stony situations at the base of the eastern flank of the Lichiang Range. Lat. 27° 10′. Alt. 9–10,000 ft. June 1906." G. Forrest. No. 2353.

"Shrub of 4–6 ft. Flowers rose pink. Open situations in cane brakes in side valleys of the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 9–11,000 ft. July–August 1906." G. Forrest. No. 4405 ex pte.

17. **Rubus foliolosus,** D. Don. Prodr., p. 256. Franchet, in Plant. Delav. (1889), p. 208 (an *R. chinensis.* Thunbg. ?).

Tali Range. Lat. 27° 10′. G. Forrest. No. 4405 ex pte. Cf. sub. *R. micrantho.*

18. **Rubus ellipticus,** Sm., var. **obcordatus,** Franch., in Plant. Delav. (1889), p. 206.

"In thickets on the margin of pine forests in the Sungkwei valley. Plant of 10–20 ft. Lat. 26° 30′. Alt. 90,000 ft. September 1904." G. Forrest. No. 291.

19. **Rubus subornatus,** Focke. Sp. nov. Plate lxix.

Frutex ramis arcuatis, 1–2 m. altus; turiones hornotini? Rami vetusti teretes, glabri, hinc inde aculeis e basi latâ lanceolatis instructi. Rami fertiles, praeter flores magnos, illis *R. idaei* admodum similes, teretes, inferne parce, superne densius pilosi, aculeis falcatis armati. Folia ternata, apicem versus in bracteas abeuntia; petioli laxe villosi, aculeis uncinatis armati; stipulae anguste lineares; foliola membranacea, utrinque fere 6–9 nervia, grosse inciso-serrata, supra puberula, glabrescentia, subtus appresse albo-tomentosa; terminale e basi saepe cordatâ ovatum vel subtrilobum, fere 5–6 cm. longum, lateralia subsessilia, oblonga. Flores in ramis longis 6–10, in brevibus 1–3, nutantes, expansi diam. 2·5–3·0 cm., praeter terminalem in axillis bractearum vel saepius foliorum superiorum, saepissime solitarii, rarius bini; pedunculi 1–3 cm. longi, parce vel crebre aculeati; calyx externe cano-tomentellus; cupula plana, sepala triangulari-lanceolata, mucronata vel aristata, post anthesin patentia; petala obovata, sepalis, praeter mucronem, fere aequilonga, roseo-purpurea; stamina fere uniseriata, post anthesin patentia, filamentis longis glabris; carpellorum capitulum fundo nudum; carpella parce vel dense pilis strictis hispida; styli longi, filiformes.

Rami florentes habitu illis *R. idaei* similes, sed flores multo majores.

a. **forma parce vel non glandulosa.**

"Shrub of 4–6 ft. Flowers purplish rose. Rocky situations on the margins of cane-brakes on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 9–11,000 ft. August 1906." G. Forrest. No. 4402.—Eglandular.

"Spinous shrub, branches arched, of 4–7 ft. Flowers rose carmine. Grassy openings in mixed forests on the eastern flank of the Lichiang Range. Lat. 27° 10′. Alt. 9–10,500 ft. June 1906." G. Forrest. No. 2302.—Glands rare.

b. **var. melanadenus.**

Rami floriferi breves, praecipue in partibus superioribus copiose nigro-glandulosi.

"Shrub of 3–5 ft. Flowers rose red. Dry, shady situations in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 12′. Alt. 10–11,000 ft. May 1906." G. Forrest. No. 2124.

LIST OF PLATES.

Illustrating Dr. W. O. Focke's Paper on Species of Rubus collected by George Forrest in Yunnan and Eastern Tibet.

PLATE LXIII. Rubus major, Focke. Sp. nov.
LXIV. Rubus hypopitys, Focke. Sp. nov.
LXV. Rubus stimulans, Focke. Sp. nov.
LXVI. Rubus trijugus, Focke. Sp. nov.
LXVII. Rubus alexeterius, Focke. Sp. nov.
LXVIII. Rubus stans, Focke. Sp. nov.
LXIX. Rubus subornatus, Focke. Sp. nov.

Rubus major, *Focke.*

Rubus hypopitys, *Focke.*

Rubus stimulans, *Focke*.

Rubus trijugus, *Focke.*

Rubus alexeterius, *Focke.*

Rubus stans, *Focke.*

Rubus subornatus, *Focke*.

Plantae Chinenses Forrestianae.

Plants discovered and collected by George Forrest during his first exploration of Yunnan and Eastern Tibet in the years 1904, 1905, 1906.

Enumeration and Description of Species of Pedicularis.

BY

GUSTAVE BONATI,

Lure.

With Plates LXX.–LXXV.

Sect. I. SIPHONANTHAE.

1. **Pedicularis labellata,** Jacquem. ex Decne, in Voy. Jacquem. Bot., p. 118, t. 123.

"Pass between Teng Chuan and Sung Kwei valleys. Moist, rocky places. Alt. 9–10,000 ft. Flowers crimson. September 1904." G. Forrest. **No. 1130.**

"Marshy ground, margins of lake north of Chung Tien. Alt. 13,000 ft. 1904." G. Forrest. **No. 1131.**

2. **Pedicularis longiflora,** Rudolph., in Mém. Acad. St. Petersb. iv, p. 345, t. 3; Maxim. Mél. Biol. x, p. 86.

"Marshy ground on borders of a large lake 8 to 9 miles north of Chung Tien. Alt. 11,800 ft. Flowers bright orange. September 1904." G. Forrest. **No. 1132.**

3. **Pedicularis siphonantha,** Don. Prodr. Fl. Nepal., p. 95.

"Marshy ground on borders of a large lake north of Chung Tien. Alt. 11,800 ft. Flowers red. September 1904." G. Forrest. **No. 1133.**

[Notes, R.B.G., Edin., No. XXIII., December 1911.]

"Plant of 3–7 inches. Flowers bright rose-crimson. Moist, rocky mountain meadows on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 5078.

4. **Pedicularis Delavayi,** Franch. ex Maxim., in Mél. Biol. xii, p. 897.

"Plant of 4–6 inches. Flowers bright magenta-rose and white. Open mountain pastureland on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. July 1906." G. Forrest. No. 2638.

5. **Pedicularis oxycarpa,** Franch. ex Maxim., in Mél. Biol. xii, p. 804, fig. 19.

"Plant of 8–14 inches. Flowers rose and white. Open, grassy situations in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 10,500–11,000 ft. June 1906." G. Forrest. No. 2450.

6. **Pedicularis cephalantha,** Franch. ex Maxim., in Mél. Biol. xii, p. 805, fig. 20.

"Plant of 6–10 inches. Flowers deep rich rose. Grassy, rocky slopes on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 11–12,000 ft. July 1906." G. Forrest. No. 2547.

7. **Pedicularis longipetiolata,** Franch. ex Maxim., in Mél. Biol. xii, p. 806.

"Plant of 10–15 inches. Flowers bright rose. Open mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 25′. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 3059.

8. **Pedicularis polyphylla,** Franch. ex Maxim., in Mél. Biol. xii, p. 809, fig. 16.

"Plant of 12–16 inches. Flowers rose. Dry, rocky pastureland on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 9–10,000 ft. June–July 1906." G. Forrest. No. 4493.

var. **pilosa**, Bonati. Var. nov.

Tota pilis rufis lanuginoso-pilosa.

"Procumbent plant of 1–2 ft. Flowers magenta-rose.

Open, grassy situations amongst scrub on the eastern flank of the Lichiang Range. Lat. 27° 15′. Alt. 10–11,000 ft. July 1906." G. Forrest. No. 2640.

9. **Pedicularis gruina,** Franch. ex Maxim., in Mél. Biol. xii, p. 799, fig. 15.

"Plant of 6–9 inches. Flowers dull crimson. Rocky, grassy situations amongst scrub on the eastern flank of the Lichiang Range. Lat. 27° 15′. Alt. 10–10,500 ft. August 1906." G. Forrest. No. 2725.

"Moist places in most valleys north of Talifu. Alt. 7–11,000 ft." G. Forrest. No. 1134.

10. **Pedicularis Margaritae,** Bonati. Sp. nov. Plate lxx.

Radix ? Caulis ascendens, flexuosus, 45 cm. ac ultra longus, pilis albis lanuginosis praesertim summo tectus, ramosus, ramis ascendentibus. Folia radicalia ?. Folia caulina alterna, petiolata, petiolis 10–20 mm. longis, membranaceis ac alatis; limbo 2–4·5 cm. longo, 2 cm. lato, bipinnatilobato, lobis obtusis, lobulis dentatis; bracteae foliaceae, petiolis 10–20 mm., membranaceis, perlucidis, limbo 6–8 mm. longo, lobis 3–5 sparsis. Flores axillares. pauci, pedunculati, pedunculis 5–10 mm. longis, erectis, pilosis, Calyx membranaceus, cylindricus, 6–8 mm. longus, anticem usque ad medium fissus, lobis 5 subaequalibus, pinguibus, flabellatis, plus minusve dentatis. Corolla rosea tubo glabro, calyce duplo longiore; galea rectangulatim curvata, in parte inferiori circiter 6 mm. longa, erecta; in horizontali 3 mm. longa, abrupte in rostrum filiformem, 4–5 mm. longum, rectum vel vix incurvatum, contracta; margine inferiori addita ad faucem lateraliter dente vix distincta; dorso rotundo, villoso; labio inferiore superius aequante; lobo medio lateralibus minore, margine glabra. Stamina in medio tubi inserta; filamentis omnibus villosis. Capsula ac semina ?

"Plant of 1–1½ ft. Flowers rose. Open, grassy situations amongst scrub on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 9–10,000 ft. June–July 1906." G. Forrest. No. 4504.

This plant seems to be intermediate between *P. cephalantha*, Franch., of which it has the helmet suddenly contracted into a long beak, and *P. longipetiolata*, Franch., which it resembles in habit.

It differs from *P. cephalantha*, Franch., by :—

1. Its habit is quite different; its inflorescence is much looser; the whole plant is covered by white woolly hairs.

2. Its leaves, even the lower ones, are never pinnatisect.

3. Its bracts are widened at the base and long-petiolate; its peduncles are longer; the calyx is very hairy and its teeth are toothed.

4. All the filaments are hairy.

It differs from *P. longipetiolata*, Franch., by :—

1. Its hairiness and its leaves are not pinnatisect.

2. Its helmet is suddenly contracted into a beak and pilose at the back.

3. The teeth of the edge of the helmet are obsolete.

4. All the filaments are hairy.

5. Its corolla is shorter, as is the calyx.

P. oligantha, Franch., of the same affinity and the same region, is glabrous; its calyx has only 2–3 teeth, the tube of its corolla is not longer than the calyx, the back of its helmet is glabrous; the teeth of the edge are very prominent; the lower lip is fimbriate; the filaments are glabrous.

SECT. II. **ORTHORRHYNCHAE.**

11. **Pedicularis axillaris,** Franch. ex Maxim., in Mél. Biol. xii, p. 825, fig. 39.

"Plant of 4–6 inches. Flowers rose. Moist pastureland on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–9000 ft. May–June 1906." G. Forrest. No. 4485.

"Procumbent plant of 1–2 ft. Flowers bright rose-red. Moist, shady situations in mixed and pine forests on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 10–11,000 ft. July 1906." G. Forrest. No. 2628.

12. **Pedicularis Balfouriana,** Bonati. Sp. nov. Plate lxxi.

Species perennis, multicaulis; collo radicis inflato, cum fibris filiformibus elongatis; caulibus erectis vel patulo-diffusis, 12–15 cm. longis, simplicibus, angulosis, glabris vel in sulcis ciliatis, paucifoliatis. Folia glabra; radicalia opposita, petiolis planis, alatis, 3–4 cm. longis, limbo ovato-elongato, 7–8 cm. longo bipinnatisecto, segmentorum 8–10 jugis quorum inferiora parva, petiolulata ac valde distantia, superiora linearia, 10–15 mm. longa, 2–3 mm. lata, sessilia; lobulis obtusis, integris vel obtuse dentatis, sessilibus, 4–7 jugis. Bracteae ac folia caulinaria foliis radicalibus similes, brevius petiolatae. Flores omnes axillares, pedunculati, pedunculis erectis, 7–22 mm. longis. Calyx campanulatus, tubo glabro, 4–5 mm. longo, dentibus

5, 2–3 mm. longis, basi anguste linearibus, summo dilatatis ac inciso-foliaceis, margine ciliatis. Corolla viridulo-alba 8 mm. longa, tubo cylindrico, 8–10 mm. longo, calycem circiter duplo-superante ; galea rectangulata, in parte erecta tubum aequans, in horizontali 4–5 mm. longa, attenuata in rostrum linearem, 5–6 mm. longum, rectum vel vix incurvatum, summo emarginatum ; margine inferiore galea aliâ et alterâ parte obtuse gibbosa ; labio inferiore superius aequante vel vix superante, margine pilis raris ac longis ciliata ; lobis vix inaequalibus. Stamina tertio inferiore tubi inserta ; filamentis omnibus glabris. Capsula ac semina ?

" Plant of 6–8 inches. Flowers greenish-white. Open, stony pastureland on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. June 1906." G. Forrest. No. 4489.

The nearest form is *P. axillaris*, Franch., from which the new species differs by its habit, the shape of the leaves, the colour of the corolla ; the petioles and peduncles are much longer.

13. **Pedicularis alopecuros,** Franch. ex Maxim., in Mél. Biol. xii, p. 816, fig. 33.

" Plant of 1–2 ft. Flowers canary yellow, upper segment rose. Moist, shady situations amongst grass along the base of the eastern flank of the Lichiang Range. Lat. 27° 10′ N. Alt. 8500–9000 ft. July 1906." G. Forrest. No. 2649.

" Dry, shady, grassy situations in pine and mixed forests on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 9–10,000 ft. September 1906." G. Forrest. No. 2945.

14. **Pedicularis gyrorhyncha,** Franch. ex Maxim., in Mél. Biol. xii, p. 812, fig. 24.

" Plant of 1–4½ ft. Flowers yellow. Common in most marshy woods up to an elevation of 9000 ft." September 1904. G. Forrest. No. 1135.

" Plant of 1½–2 ft. Flowers pale rose. Grassy openings in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 10–11,000 ft. September 1906." G. Forrest. No. 2944.

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15. **Pedicularis Smithiana,** Bonati. Sp. nov. Plate lxxii.

Multicaulis, radice fibrosa ; fibris multis elongatis, linearibus vel vix inflatis. Caules 25–45 cm. alti, simplices, erecti, angulosi, in sulcis villosi, alio glabri. Folia radicalia caduca ; caulinaria

pubescentia, 4-verticillata, in verticillis paucis ac distantibus, petiolata ; petiolis 2–3 cm. longis, alatis ; limbo 25–40 mm. longo, ovato-acuto, pinnatifido, loborum 3–9 jugis, lobis lineato-obtusis, irregulariter incisis. Folia superiora caulinaribus similia, petiolis brevibus, villosissimis. Bracteae inferiores, foliaceae. sessiles, flores superantes ; superiores membranceae, integrae, lineares, basi dilatatae, sessiles ac margine ciliatae. Flores axillares, sessiles, 4-verticillati, in spicam terminalem densam. Calyx 6–8 mm. longus, tubo membranaceo, perlucido, inflato, cum nervis 10 eminentibus ac villosis ; dentibus 5, media breviore, lanceolato-acuta, integra ; lateralibus summo acuti-dentatis, aliquando 2–3 lobatis. Corolla dilute lutea, tubo calycem vix superante, 8 mm. longo ; galea rectangulata, in parte verticali 4–5 mm. longa, in horizontali 3 mm., abrupte contracta in rostrum subfiliformem, gracilem, curvatum, saepe summo erectum ; labio inferiore superius aequante, margine glabro, trifido, lobis lateralibus ovato-obtusis, medio angustiore. Stamina tertio superiore tubi inserta ; filamentis omnibus glabris. Capsula ac semina ?

" Plant of 6–15 inches. Flowers dull yellow. Shady, grassy situations in the margins of pine forests on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10,500–11,500 ft. August 1906." G. Forrest. No. 2860.

16. **Pedicularis gracilis,** Wall. ex Benth., Scroph. Ind., p. 52 ; Maxim., in Mél. Biol. xii, p. 822.

" Plant of $1\frac{1}{2}$–$2\frac{1}{2}$ ft. Flowers rose. Amongst rhododendron scrub on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 9–10,000 ft. July 1906." G. Forrest. No. 4496.

17. **Pedicularis tantalorhyncha** (Franch. msc.) Bonati.

" Plant of 4–8 inches. Flowers rose. Shady situations in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10,000 ft. July 1906." G. Forrest. No. 4497.

18. **Pedicularis debilis,** Franch. ex Maxim, in Mél. Biol. xii, p. 817.

" Plant of 2–3 inches. Flowers rose. Boggy pastureland by the sides of streams on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 9000 ft. June 1906." G. Forrest. No. 4491, partly.

19. **Pedicularis porrecta,** Wall. Cat. n. 423 (*P. leiandra*, Franch. ?).

"Plant of 9–18 inches. Flowers rose. Grassy situations on the margins of mixed forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. June 1906." G. Forrest. No. 4492.

SECT. III. RHYNCHOLOPHAE ALTERNIFOLIAE.

20. **Pedicularis Viali,** Franch., in Journ. Linn. Soc. xxvi, p. 219.

"Plant of 2–4 ft. Flowers rose. Shady situations in pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. July–August 1906." G. Forrest. No. 4498.

21. **Pedicularis tenuisecta,** Franch. ex Maxim., in Mél. Biol. xii, p. 831, fig. 46.

"Plant of 12–18 inches. Lower lobe of corolla light-rose, upper, deep-rose."

"Dry, rocky situations amongst scrub on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 9500–10,500 ft. July 1906." G. Forrest. No. 2785.

"Amongst scrub in side valleys on the eastern flank of the Tali Range. Lat. 23° 40′ N. Alt. 9–10,000 ft. June 1906." G. Forrest. No. 4495.

22. **Pedicularis veronicæfolia,** Franch., in Bull. Soc. Bot. Fr. xlvii, p. 30.

"Plant of 6–14 inches. Flowers deep rose-crimson. Stony mountain pasture on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–11,000 ft. July–August 1906." G. Forrest. No. 4676.

This is a more hairy form, with filaments slightly bearded at the base and larger flowers.

23. **Pedicularis crenata,** Maxim., in Mél. Biol. xii, p. 832, fig. 53.

"Plant of 5–9 inches. Flowers deep rose. Open, moist situations amongst rocks in side valleys on the eastern flank of the Lichiang Range. Lat. 27° 25′. Alt. 12–13,000 ft. October 1906." G. Forrest. No. 3079.

24. **Pedicularis yunnanensis,** Franch. ex. Maxim., in Mél. Biol. xii, p. 851.

"Plant of 6–8 inches. Flowers rose. Mountain meadows on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–12,000 ft. July–August 1906." G. Forrest. No. 4499.

25. **Pedicularis tsangchanensis,** Franch. ex. Maxim., in Mél. Biol. xii, p. 850.

"Plant of 4–6 inches. Flowers rose. Ledges of cliffs and on humus-covered boulders in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–11,000 ft. June–August 1906." G. Forrest. No. 4501.

26. **Pedicularis filicula,** Franch. ex Maxim., in Mél. Biol. xii, p. 853.

"Plant of 4–6 inches. Flowers deep crimson. Rocky grassy slopes on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 11–12,000 ft. June 1906." G. Forrest. No. 2420.

27. **Pedicularis Forrestiana,** Bonati. Sp. nov. Plate lxxiii.

Radix pinguis, horizontalis, fibris linearibus, elongatis, addita. Caules multi, adscendentes vel erecti, 15–20 cm. alti, basi cylindrici, summo angulosi, pubescentes, simplices. Folia radicalia multa, longe petiolata ; petiolis 5–6 cm. longis, alatis ac pilis rufis vel albidis ciliatis ; limbo 3–5 cm. longo, 1–2 cm. lato, petiolo decurrenti, lineato-oblongo, pinnatilobato, loborum 8–10 jugis, 4–6 mm. longis, 2–4 mm. latis, obtusis, plus minusve incisis, dentibus acutis vel obtusis. Folia caulinaria ac bracteae radicalibus similia, sed minora ac brevius petiolata. Flores axillares, distantes, pedunculis gracilibus, erectis, glabris, 5–8 mm. longis. Tubus calycis cylindricus, glaber, 7–8 mm. longus ; lobis 5, sessilibus, flabellatis, acutidentatis, 1–2 mm. longis. Corolla rosea ; tubo calycem duplo-superante, summo dilatato ; galea rotunda, in parte erecta 4–5 mm. longa, in horizontali 5–6 mm., dorso cristata ac saepe paulo villosa, margine glabra ac latere dentata, dentibus porrectis ac ad faucem reflexis ; galea rostro falcato, lente attenuato, summo integro, 5 mm. longo, obliquo ; labio inferiore superius aequante, superficialiter trilobato ; lobo medio lateralibus minore, vix proeminente, cucullato ; margine dense ciliato. Stamina tertio inferiore tubi inserta ; filamentis paulo villosis. Capsula ac semina ?

"Plant of 6–9 inches. Flowers bright rose-red. Dry, open situations on limestone drift at base of cliffs on the eastern

flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. August 1906." G. Forrest. No. 2703.

This plant is allied to *P. tsangchanensis*, Franch., but very different from it in the shape of the lower lip bearded at the edge, and in the stamens slightly hairy.

28. **Pedicularis taliensis,** Bonati. Sp. nov. Plate lxxiv. (*Tristes*).

Radix fibrosa. Uni- vel pluricaulis. Caules erecti, 15–20 cm. alti, e basi ramosi, ramis erectis vel paulo divergentibus, angulosi, glabri vel in sulcis solum villosi. Folia radicalia caduca ; caulinaria glabra, alterna, petiolata (petiolis 4–10 mm. longis), limbo ovato-obtuso, circiter 2 cm. longo, 15 mm. lato, pinnatisecto, segmentorum sessilium 3–5 jugis, distantibus, lineato-oblongis, pinnatilobulatis, lobulis obtusis ; folia superiora caulinaribus similia sed breviora. Bracteae foliaceae, petiolulatae. Flores axillares, soli, valde distantes, breve pedunculati, erecti ; pedunculis 1–2 mm. longis. Calyx minimus, 3–4 mm., campanulatus ; tubo membranaceo perlucido, piloso, nervis eminentibus, summo truncato, 5–7 dentibus integris, acutis, minimis, prope nullis. Corolla dilute rosea, tubo calycem aequante vel paulo superante, summo dilatato ; galea dorso villosa, rectangulatim curvata, in parte erecta 5 mm. longa, in horizontali brevior, in rostrum conicum, brevissimum, erectum ac summo emarginatum, paulatim attenuata ; labio inferiore superius aequante, margine longe ciliato, lobo medio proeminente, ovato-obtuso, latiore quam longo, lateralibus multo breviore. Stamina medio tubi inserta ; filamentis paulo villosis. Capsula calyce 2- vel 2.5-plo longior, prismatica, summo oblique truncato. Semina ?

" Plant of 4–10 inches. Flowers pale rose. Grassy situations on the margins of pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–11,000 ft. July–August 1906." G. Forrest. No. 4500.

In habit and leaves this species refers *P. tibetica*, Franch., and *P. Souliei*, Franch. ; it is distinguished, however, by its nearly sessile flowers, the short beak, the short hairy helmet, and, especially, by the shape of the calyx.

29. **Pedicularis Stadlmanniana,** Bonati. Sp. nov. Plate lxxv. (*Tristes*).

Species diffusa, multicaulis ; radix fibrosa, pilis rufis vel albidis tecta. Caulis centralis erectus, 6–10 cm. altus, e basi ramosus ; caules ac racemi laterales patuli, repentes, 10 cm.

ac ultra longi, saepe simplices. Folia radicalia caduca, caulinaria alterna, petiolata; petiolis 10–15 mm. longis, alatis, ac pilis longis, rufis, dense ciliatis; limbo ovato-obtuso, 15–20 mm. longo ac lato, pinnato, loborum 4–5 jugis; lobis inferioribus deltoideis, superioribus linearibus, obtusis, acutidentatis. Bracteae foliis similes. Flores axillares, pedunculis 5–20 mm. longis, erectis. Calyx campanulatus, anticem usque ad medium fissus ac subspathiformis; tubo membranaceo, perlucido, nervis 5 eminentibus, plus minusve reticulatis ac pilis albis pluricellularibus tectis; lobis 5 inaequalibus, pedicellatis, summo foliaceis, triangulato-acutis, summo generaliter additis pilis 2, albis, brevibus, rigidis, divergentibus. Corolla dilute rosea, tubo 7–8 mm. longo, calycem aequante vel paulo superante, lato, summo dilatato; galea tubum aequans, rectangulata, dorso rotundo ac piloso, praesertim anticem, abrupte in rostrum rectum vel vix incurvatum, glabrum, 7 mm. longum, summo breve bifidum, contracta; margine inferiori glabra ac fauce dente una addita; labio inferiore alterum superante, margine ciliato; lobo medio lateralibus breviore ac angustiore. Stamina medio tubi inserta, filamentis omnibus villosis, duobus anterioribus densius.

"Plant of 2–8 inches. Flowers pale rose. Grassy openings in pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. July 1906." G. Forrest. No. 4488.

This is very like *P. gruina* var. *cinerascens*, but easily recognised by the calyx split and the helmet being hairy at the back. By this latter character it approaches *P. cephalantha*, Franch., but it differs from that species by the habit and the tube of corolla hardly longer than the calyx and widened at the summit.

30. **Pedicularis recurva,** Maxim., in Mél. Biol. xii, p. 838, fig. 59, var. **polyantha,** Bonati.

Caules numerosi. Inflorescentia multiflora. Calycis dentes margine ciliati.

"Plant of 12–18 inches. Flowers deep crimson, apex of upper lobe white, spotted crimson."

"At the base of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. August 1906." G. Forrest. No. 2667.

SECT. V. BIDENTATAE VERAE.

31. **Pedicularis hirtella,** Franch., in Journ. Linn. Soc. xxvi, p. 209.

"Plant of 9–14 inches. Flowers deep crimson. Grassy situations on the margins of cane brakes on the eastern flank

of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. October 1906." G. Forrest. No. 3077.

SECT. VI. **BIDENTATAE VERTICILLATAE.**

32. **Pedicularis comptoniaefolia,** Franch. ex Maxim., in Mél. Biol. x, p. 89 ; xii, p. 796.

"Mekong-Salwin divide, behind Tse Kou mission, Tibet. 1904." G. Forrest. No. 1136.

"Plant of 1½–2 ft. Flowers deep rose. Dry, open situations amongst rocks on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10,000 ft. August 1906." G. Forrest. No. 2790.

"Plant of 1–3 ft. Flowers purplish-rose. Dry, stony situations amongst scrub at the base of cliffs on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. July 1906." G. Forrest. No. 4487.

33. **Pedicularis deltoidea,** Franch. ex Maxim., in Mél. Biol. xii, p. 791, fig. 7.

"Plant of 5–6 inches. Flowers rose. Moist pastureland along the base of the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 6700–8000 ft. May 1906." G. Forrest. No. 4490.

"Plant of 3–6 inches. Flowers bright carmine. Mossy, boggy situations on western slopes of Tsan Shan range near head of Yang-pi valley. Lat. 25° 40′ N. September 1903." G. Forrest. No. 976.

34. **Pedicularis lutescens,** Franch. ex Maxim., in Mél. Biol. xii, p. 898.

"Plant of 6–9 inches. Flowers canary yellow. Stony, grassy slopes on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 2937. This is more hairy than the following specimen.

"Plant of 5–8 inches. Flowers yellow. Open, mountain pastureland on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–11,000 ft. June–July 1906." G. Forrest. No. 4494.

35. **Pedicularis rex,** Clarke ex Maxim., in Mél. Biol. xii, p. 875.

"Plants from 1–5 ft. Flowers yellow. In moist situations in most valleys. Alt. 6–11,000 ft. September 1904." G. Forrest. No. 1137.

"Moist, shady situations in and on the margins of pine and other forests on the eastern flank of the Lichiang Range.

Common all along base of flank. Lat. 27°–27° 30′. Alt. 8000–11,000 ft. June 1906. Specimen from alt. 10,000 ft." G. Forrest. No. 2477.

"Open situations in pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. June–August 1906." G. Forrest. No. 4502.

36. **Pedicularis superba,** Franch. ex Maxim., in Mél. Biol. xii, p. 874, fig. 102.

"Plant of 1–2 ft. Flowers bright rose. Shady, moist situations in and on the margins of pine forests on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10–12,000 ft. July 1906." G. Forrest. No 3780.

SECT. VIII. ANODONTAE VERTICILLATAE.

37. **Pedicularis salviaeflora,** Franch., in Journ. Linn. Soc. xxvi, p. 215.

"Plant of 2–4 ft. Flowers, upper segment bright rose, lower, deep rose. In shady situations amongst scrub and grass at base of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 15′. Alt. 9500–10,500 ft. August 1906." G. Forrest. No. 2789.

38. **Pedicularis densispica,** Franch. ex Maxim., in Mél. Biol. xii, p. 882, fig. 111.

"Plant of 6–12 inches. Flowers pink and crimson. Dry, stony situations in the Lichiang valley. Lat. 27° N. Alt. 8500 ft. May 1906." G. Forrest. No. 2061.

"Plant of 4–8 inches. Flowers rose-red and very pale pink. Dry, barren, rocky pastureland on the plain at the north end of the Lichiang valley. Lat 27° 10′ N. Alt. 9000. June 1906." G. Forrest. No. 2328.

"Plant of 1–2 ft. Flowers deep rose and pink. Grassy, rocky slopes on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10,500–12,000 ft. August 1906." G. Forrest. No. 2668.

"Plant of 9–16 inches. Flowers rose. Dry pastureland along the base of the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 8–9000 ft. June 1906." G. Forrest. No. 4503.

39. **Pedicularis microchila,** Franch. ex Maxim., in Mél. Biol. xii, p. 884.

"Plant of 5–7 inches. Flowers pale rose. Mountain meadows on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. June 1906." G. Forrest. No. 4486.

40. **Pedicularis lineata,** Franch. ex Maxim., in Mél. Biol. xii, p. 887.

"Boggy pastureland by the sides of streams on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9000 ft. June 1906." G. Forrest. No. 4491, partly.

41. **Pedicularis rupicola,** Franch. ex Maxim., in Mél. Biol. xii, p. 890.

"Plant of 6–9 inches. Flowers rose-red. Open situations on limestone drift on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. August 1906." G. Forrest. No. 2859.

42. **Pedicularis likiangensis,** Franch. ex Maxim., in Mél. Biol. xii, p. 887.

"Flowers crimson. Marshy ground, margin of lake north of Chung Tien. Alt. 13,000 ft. N.-W. Yunnan, 1904." G. Forrest. No. 1138.

43. **Pedicularis szechuanica,** Maxim., in Mél. Biol. xii, p. 892.

"Plant of 6–14 inches. Flowers pale rose, veined a shade darker. Amongst heavy grass on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. July 1906." G. Forrest. No. 2594.

The total number of species of *Pedicularis* in this collection made by Mr. Forrest in the western parts of Yunnan is 43; of these 6 are new—*P. Margaritae, P. Balfouriana, P. Smithiana, P. Forrestiana, P. taliensis* and *P. Stadlmanniana*; the proportion of new species is 13, 9 per cent. of the whole. Further, 2 species (*P. siphonantha,* Don, and *P. szechuanica,* Maxim.) had not been recorded before from these regions so far as I am aware.

In comparing the results of Forrest's collections with those obtained before by Père Delavay, we note that the latter has collected at Tali and contiguous districts 48 species of *Pedicularis*. Out of these, *P. brevifolia,* Don, *P. integrifolia,* Hook. f., *P. lachnoglossa,* Hook. f., *P. longicaulis,* Franch., *P. macilenta,* Franch., *P. melampyrifolia,* Franch., *P. oligantha,* Franch., *P. rigida,* Franch., *P. rhodotricha,* Franch., *P. sigmoidea,* Franch., *P. strobilacea,* Franch., *P. villosula,* Franch., are not represented in the collection of Mr. Forrest described above. The total number of species indigenous in that part of Yunnan is, or seems to be at present, 56. Out of these, 32 species have not been recorded so far anywhere else.

LIST OF PLATES.

Illustrating M. Gustave Bonati's Paper on Species of Pedicularis collected by George Forrest in Yunnan and Eastern Tibet.

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LXXII. Pedicularis Smithiana, Bonati. Sp. nov.
LXXIII. Pedicularis Forrestiana, Bonati. Sp. nov.
LXXIV. Pedicularis taliensis, Bonati. Sp. nov.
LXXV. Pedicularis Stadlmanniana, Bonati. Sp. nov.

Pedicularis Margaritae, *Bonati.*

PLANTS OF E. TIBET AND S.W. CHINA.

COLLECTED BY GEORGE FORREST.

COLLECTOR FOR A. K. BULLEY of NESS, NESTON, CHESHIRE.

Pedicularis Balfouriana, *Bonati.*

Pedicularis Smithiana, *Bonati.*

Pedicularis Forrestiana, *Bonati.*

Pedicularis taliensis, *Bonati.*

Pedicularis Stadlmanniana, *Bonati*.

Number XXIV.

NOTES

FROM THE

ROYAL BOTANIC GARDEN,

EDINBURGH.

JANUARY 1912.

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Plantae Chinenses Forrestianae.

Plants discovered and collected by George Forrest during his first exploration of Yunnan and Eastern Tibet in the years 1904, 1905, and 1906.

Enumeration and Description of Species of Orchidaceae.

BY

DR. RUDOLF SCHLECHTER,
Berlin.

With Plates LXXVI.-LXXXIV.

Cypripedilum corrugatum, Franch. in Journ. de Bot. viii (1894), p. 251; I.F.S. iii, p. 64.

"Plant of 6–12 inches. Petals and sepals yellowish-purple, veined deep purple; rostellum purple-maroon; labellum very deep purplish-maroon, in some plants almost black. Open mountain meadows and on the margins of pine forests on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 10–11,000 ft. June 1906." G. Forrest. No. 2322.

Cypripedilum fasciolatum, Franch. in Journ. de Bot. viii (1894), p. 232; I.F.S. iii, p. 64.

"Plant of 9–12 inches. Flowers veined and streaked purplish-rose, non-fragrant. Labellum inflated, 1 × 1 inch. Dry, stony situations in open pine forests on the eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 11,000 ft. June 1906." G. Forrest. No. 2429.

Cypripedilum luteum, Franch. in Plant. David. ii, p. 126; I.F.S. iii, p. 65.

"Plant of 8–16 inches. Flowers pale yellow, marked and veined pale violet. Shady, stony situations in pine forests on

the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 10–11,000 ft. June 1906." G. Forrest. No. 2341.

Cypripedilum arietinum, R. Br. in Ait. Hort. Kew, ed. 2, v, p. 222 ; I.F.S. iii, p. 63.

" Plant of 6–12 inches. Flowers, petals and sepals brownish-green, labellum pink, veined purplish-green, apex green. Dry, shady situations in pine forests on eastern flank of the Lichiang Range. Lat. 27° 10′ N. Alt. 9–10,500 ft. May 1906." G. Forrest. No. 2198.

Cypripedilum margaritaceum, Franch. in Bull. Soc. Phil. Par. sér. 7, xii (1891), p. 141 ; I.F.S. iii, p. 66.

" Plant of 6–9 inches. Leaves coriaceous, spotted livid purple. Petals and sepals yellowish-green, spotted purple. Rostellum reddish-purple. Labellum much inflated, 2 × 1 inch, fleshy and extremely brittle, pale yellow, spotted livid purple and densely covered with purplish glandular hairs. Moist, stony situations in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 11,000 ft. June 1906." G. Forrest. No. 2264.

Cypripedilum ebracteatum, Rolfe.

" Plant of 2–6 inches. Flowers greenish-yellow, with deep purplish-maroon markings. Dry, shady situations in pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–11,000 ft. July 1906." G. Forrest. No. 4855.

Orchis Giraldiana, Kränzlin in Engler's Bot. Jahrb. xxxvi, Beibl. 82, p. 25.

" Plant of 5–8 inches. Flowers rich rose-purple. Grassy openings in and on the edges of rhododendron forests on the eastern flank of the Lichiang Range. Lat. 27° 18′ N. Alt. 10–11,000 ft. June 1906." G. Forrest. No. 2368.

" Plant of 6–14 inches. Flowers deep rose-purple. Boggy meadows on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. May–June 1906." G. Forrest. No. 4867.

" Plant of 3–8 inches. Flowers rose-purple marked a deeper shade. Stony mountain meadows on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10,000 ft. June–July 1906." G. Forrest. No. 4875.

Orchis latifolia, Linn., var.

"Plant of 9–15 inches. Flowers rose-purple, with deeper markings. Moist pastureland on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. August 1906." G. Forrest. No. 4887.

Orchis tetraloba, Schltr. Comb. nov.

Peristylus tetralobus, Finet in Rev. Génér. Botan. xiii (1901), p. 524.

This plant is better regarded as a species of the genus *Orchis,* Linn. It is nearly allied to *O. puberula,* King and Pantl. from the Himalayas. The plant is well figured by Finet on t. 13 of the above-mentioned publication.

"Plant of 6–10 inches. Flowers pale rose. Moist, stony mountain meadows on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. May–June 1906." G. Forrest. No. 4862.

"Plant of 10–14 inches. Flowers purplish-rose. Moist mountain meadows on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. June 1906." G. Forrest. No. 4863.

This has been collected before by Delavay.

26201

Orchis basifoliata, Schltr. Comb. nov.

Peristylus tetralobus, Finet, var. *basifoliatus,* Finet in Rev. Génér. Botan. xiii (1901), p. 524.

A species nearly allied to, but quite distinct from *O. tetraloba,* (Finet) Schltr. Finet considered it to be only a form, but the distinguishing characters fully justify its being regarded as a distinct species. The plant is well figured, too, by Finet on the t. 13 of the above-mentioned publication.

"Plant of 5–8 inches. Flowers pure white, basal portion of labellum, with a few markings of pale purple, faintly fragrant. Very boggy open situations at base of eastern flank of the Lichiang Range. Lat. 27° 10′ N. Alt. 8500 ft. July 1906." G. Forrest. No. 2544.

Orchis spathulata, Rchb. f., ex Hook. f., Fl. Brit. Ind. vi, p. 127; I.F.S. iii, p. 50. Finet in Rev. Génér. Bot. xiv (1901), p. 516.

"Plant of 2–4 inches. Flowers rose-purple. Moist, stony mountain pasture on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 11,000 ft. August 1906." G. Forrest. No. 4886.

Herminium ophioglossoides, Schltr. Sp. nov. Plate lxxvi.

Terrestre, erectum, pusillum, 9–22 cm. altum; tuberibus oblongoideis, radicibus flexuosis; folio basilari singulo, erecto vel erecto-patente elliptico-ligulato vel oblanceolato-elliptico, obtuso vel subacuto, glabro, basi scapum amplectente, 4–7 cm. longo, medio vel supra medium 1·2–2 cm. lato; inflorescentia stricta vel substricta, scapo tereti glabro, vulgo evaginulato, spica subdense vel sublaxe 9-multiflora, ut videtur subsecunda, usque ad 10 cm. longa; bracteis lanceolatis, acuminatis, glabris, ovarium aequantibus vel paulo superantibus; floribus illis *H. Monorchis*, R. Br. similibus sed majoribus, virescenti-flavidis, glabris, inodoris, sepalo intermedio ovato, obtuso, 0·4 cm. longo, lateralibus oblique lanceolato-ligulatis, obtusis, aequilongis; petalis e basi oblique lanceolata angustatis linearibus obtusis, 0·6 cm. longis; labello e basi oblonga e tertia parte basilari trifido, segmentis anguste linearibus subacutis, intermedio lateralibus duplo majore, 0·4 cm. longo, labello toto 0·6 cm. longo, calcare brevi, sacciformi, conico, obtuso, ovario cylindraceo, glabro, c. 0·7 cm. longo.

"Plant of 3–8 inches. Flowers greenish-yellow. Moist, grassy situations by streams at base of the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 10–11,000 ft. June 1906." G. Forrest. No. 2466.

This little species is nearly allied to *H. Monorchis*, R. Br. and *H. alaschanicum*, Maxim. It differs by the bare scape and the single basal leaf, as well as in the size of the flowers and the shape of the lip. The plant quoted by Finet (Rev. Génér. Bot. xiii, p. 518), from Hee-chan-men (Yunnan), *Delavay* No. 86, under *Herminium Monorchis*, R. Br. belongs to this species.

Herminium Forrestii, Schltr. Sp. nov. Plate lxxvii. A.

Terrestre, erectum, humile, c. 10–13 cm. altum; tuberibus oblongoideis; radicibus filiformibus elongatis, flexuosis, puberulis, foliis basilaribus 2, erecto-patentibus, ellipticis vel oblongo-elliptis, acutis, basi scapum amplectentibus; inflorescentiis strictis, scapo tereti glabro, evaginulato, spica dense multiflora 2·5–4 cm. longa, c. 1 cm. diametiente; bracteis erecto-patentibus, ovatis, acutis vel acuminatis, ovario duplo fere brevioribus; floribus in genere inter majores, erecto-patentibus, fragrantissimis, glabris; sepalo intermedio ovato, obtuso 3·5 mm. longo, lateralibus oblique oblongo-ligulatis, obtusis, intermedio aequilongis; petalis oblique lanceolato-ligulatis, obtusis, sepalis subaequilongis; labello e basi subauriculata,

ovato obtusiuscule acutato, supra basin medio lamellis 2 parallelis, basi paulo ampliatis antice leviter divergentibus, in medio labelli terminatis ornato, sepalis aequilongo, infra medium 2·5 mm. lato, anthera humili, canalibus perbrevibus, rostello triangulo; ovario cylindraceo-fusiformi, glabro, c. 0·5 cm. longo.

"Plant of 3–6 inches. Flowers green, deliciously fragrant, odour resembling vanilla. Open mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 11–12,000 ft. July 1906." No. 2590.

This interesting species is closely allied to the Himalayan *H. Josephi*, Rchb. f., but has a dense many-flowered inflorescence of smaller flowers and broader leaves. Besides, there are distinct differences in the shape and the keels of the labellum.

Herminium forceps, Schltr. Comb. nov.

Peristylus forceps, Finet in Rev. Génér. Botan. xiii (1901), p. 521.

"Plant of 4–8 inches. Flowers green, fragrant. Stony mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. October 1906. G. Forrest. No. 3075.

This plant should rather be regarded as a species of *Herminium*.

Herminium coeloceras, Schltr. Comb. nov.

Peristylus coeloceras, Finet in Rev. Génér. Botan. xiii, p. 519.

"Flowers rose-purple and white, fragrant. Dry pasture on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. July–August 1906." G. Forrest. No. 4878.

This species as well should be regarded as a *Herminium*. To the same genus belongs *H. ecalcaratum*, Schltr., which has also been published by Finet as *Peristylus*, and is too a plant from Yunnan.

Herminium unicorne, Kränzlin.

"Plant of 3–8 inches. Flowers white, fragrant. Dry, stony pastureland at the base of the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 8500–9000 ft. July 1906." G. Forrest. No. 2583.

Herminium Souliei, Rolfe in I.F.S. iii, p. 51.

"Plant of 8–12 inches. Flowers green. Grassy openings in pine forests on the eastern flank of the Tali Range. Lat. 25°

40′ N. Alt. 9–11,000 ft. June–July 1906." G. Forrest. No. 4864.

This is known from Szechuan, Tongolo (Soulié).

Herminium angustifolium, Benth. ex Hook. f., Fl. Brit. Ind. vi, p. 129; I.F.S. iii, p. 50; Finet in Rev. Génér. Botan. xiii (1901), p. 517.

"Plant of 12–15 inches. Flowers greenish-white. Grassy openings in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. September 1906." G. Forest. No. 2876.

"Plant of 10–15 inches. Root tuberous. Flowers green, fragrant. Dry, stony situations on grassy slopes on the eastern flank of the Lichiang Range. Lat. 27° 20′. Alt. 10–11,000 ft. July 1906." G. Forrest. No. 2784.

"Plant of 1–2 ft. Flowers green. Grassy openings in, and on the margins of, pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. July 1906." G. Forrest. No. 4877.

Hemipilia brevicalcarata, Finet in Bull. Soc. Bot. France, xliv (1897), t. 14, p. 420, figs. A.–G.; I.F.S. iii, p. 62.

"Plant of 3–6 inches. Flowers purplish-rose. Boggy situations by streams in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. June 1906." G. Forrest. No. 4868.

Hemipilia yunnanensis, (Finet) Schltr.

H. cordifolia, Lindl., var. *yunnanensis,* Finet in Rev. Génér. Botan. xiii (1901), p. 510.

"Plant of 6–9 inches. Flowers rose, with markings of a deeper shade, non-fragrant. Foliage green, spotted purple on upper surface, purple on under. Stony situations on dry open banks amongst scrub on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 9–10,000 ft. June 1906." G. Forrest. No. 2397.

Hemipilia flabellata, Bur. et Franch. in Journ. de Bot. v (1891), p. 152; I.F.S. iii, p. 62.

"Plant of 1–2 ft. Root tuberous. Sepals and petals bright rose, labellum very deep rose. Moist, shady situations amongst scrub on the eastern flank of the Lichiang Range. Lat. 27° 25′. Alt. 9–10,500 ft. August 1906." G. Forrest. No. 2844.

Hemipilia Henryi, Rolfe in Kew Bull. 1896, p. 203, var.

"Plant of 9–10 inches. Flowers rose-pink. Dry, shady banks in thickets in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–9000 ft. August–September 1906." G. Forrest. No. 4890.

Gymnadenia pseudo-diphylax, Kränzlin in Engler's Bot. Jahrb. xxxvi, Beibl. 82, p. 25.

"Plant of $2\frac{1}{2}$–6 inches. Flowers rose-red. Stony mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 9–10,500 ft. September 1906." G. Forrest. No. 2972.

"Plant of 3–4 inches. Flowers pale rose-purple. Grassy, shady situations by streams in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. August 1906." G. Forrest. No. 4885.

Platanthera japonica, Lindl. Gen. et Sp. Orch., p. 290; I.F.S. iii, p. 56.

"Plant of 9–18 inches. Flowers green, fragrant. Grassy, shady situations on the margins of mixed and pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–11,000 ft. July 1906." G. Forrest. No. 4866.

"Lichiang Range. Lat. 27° 20′ N. Alt. 10,000 ft. July 1906." G. Forrest. No. 2586.

Platanthera Henryi, Rolfe in I.F.S. iii, p. 55.

"Plant of 1–2 ft. Flowers green, faintly fragrant. Open grassy slopes on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10,500–11,500 ft. August 1906." G. Forrest. No. 2787.

Platanthera interrupta, Maxim. in Bull. Ac. Sc. St. Petersb. xxxi (1887), p. 106; I.F.S. iii, p. 56.

"Plant of 18–24 inches. Flowers green, fragrant. Stony mountain meadows on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. June–July 1906." G. Forrest. No. 4861.

Habenaria glaucifolia, Bur. et Franch. in Journ. de Bot. v (1891), p. 152. Finet in Rev. Génér. de Bot. xiii (1901), p. 530, pl. 18, figs. 9–16.

"Plant of 1–1·5 ft. Flowers green. Root with an odour similar to valerian. Dry open situations in pine forests at the

north end of the Lichiang valley. Lat. 27° 20′ N. Alt. 9–10,000 ft. July 1906." G. Forrest. No. 2746.

Habenaria Delavayi, Finet in Rev. Génér. de Bot. xiii (1901), p. 527, pl. 16*b*, figs. 16–28.

" Plant of 6–12 inches. Flowers, upper segment of perianth deep green, the remainder almost white, faintly fragrant. Dry barren pastureland at the base of the eastern flank of the Lichiang Range. Lat. 27° 20′. Alt. 8500–9000 ft. August 1906." G. Forrest. No. 2677.

" Plant of 1–1½ ft. Flowers green and white, fragrant. Dry open pastureland on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. August 1906." G. Forrest. No. 4888.

Habenaria Aitchisoni, Rchb. f.; Finet in Rev. Génér. Bot. xiii (1901), p. 526.

" Plant of 6–9 inches. Flowers green, fleshy, fragrant. Ledges and crevices of moist cliffs, and on limestone drift on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft." G. Forrest. No. 2704.

" Plant of 6–9 inches. Flowers green, fragrant, mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 10–11,000 ft. August 1906." G. Forrest. No. 2739.

Habenaria diplonema, Schltr. Sp. nov. Plate lxxvii. B.

Terrestris, erecta, pusilla 8–13 cm. alta; tuberibus globosis; foliis basilaribus 2, humistratis, suborbicularibus, acuminatis utrinque glabris, pulchre nervis albis reticulato-ornatis, 1·6–2 cm. longis, medio fere 1·4–1·7 cm. latis; scapo gracili, evaginulato, tereti, minutissime puberulo, racemo laxius 6–14-floro, subsecundo, usque ad 7 cm. longo; bracteis lanceolatis, acuminatis, ovario duplo fere brevioribus; floribus erectis vel erecto-patentibus, parvulis, viridibus; sepalo intermedio erecto ovali, obtusiusculo, glabro, vix 0·4 cm. longo, lateralibus deflexis, oblique ellipticis obtusiusculis, intermedio aequilongis; petalis erectis oblique subfalcato-ovatis, basi margine anteriore conspicue dilatatis, glabris, sepalis subaequilongis; labello trifido, segmentis lateralibus filiformibus 0·6–0·7 cm. longis, intermedio lineari-ligulato, subacuto, 0·2 cm. longo; calcare clavato, incurvo, c. 0·4 cm. longo; anthera apice retusa, canalibus abbreviatis, rostello humili obtusissimo; processibus stigmatiferis

clavatis, canalibus antherae plus duplo longioribus, ovario cylindraceo, minutissime puberulo c. 0·7 cm. longo.

"Plant of 3–7 inches. Flowers green, faintly fragrant. Root tuberous. Shady, dry situations on ledges of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. August 1906." G. Forrest. No. 2812.

An ally of *H. Aitchisoni*, Rchb. f., but easily distinguished by the very long filiform side-segments of the lip. The leaves are very nicely pictured on the upper surface by white reticulated nerves.

26213

Habenaria diceras, Schltr. Sp. nov. Plate lxxviii.

Terrestris, erecta, 25–35 cm. alta; foliis basilaribus 2, humistratis, suborbicularibus apiculatis, utrinque glabris, c. 5 cm. longis, medio fere 4·7–5·3 cm. latis, scapo tereti, minute puberulo, bracteis pluribus bracteiformibus obsesso; spica cylindrica dense multiflora 9–12 cm. longa, 1·7–2 cm. diametiente; bracteis erecto-patentibus lanceolatis, acuminatis, ovario aequilongis vel paulo brevioribus; floribus erecto-patentibus, parvulis, viridibus; sepalo intermedio erecto, ovato, obtuso, glabro, c. 0·7 cm. longo, lateralibus falcato-oblongis, obtusiusculis, reflexis, intermedio aequilongis; petalis oblique lanceolato-ligulatis, obtusis, glabris, erectis, sepalo intermedio aequilongis; labello trifido, segmentis lineari-subulatis 0·6 cm. longis, glabris, intermedio deflexo, lateralibus falcato-adscendentibus, corniformibus, calcare filiformi-cylindrico, apicem versus paululo dilatato, glabro, 0·7 cm. longo; anthera apice retusa, canalibus abbreviatis, processibus stigmaticis subclavatis, antherae canales bene superantibus; ovario minute papilloso-puberulo, cylindraceo, c. 0·8 cm. longo.

"Plant of 6–12 inches. Flowers green. Dry, shady situations in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 9–10,000 ft. October 1906." G. Forrest. No. 3074.

This species belongs, like *H. diplonema*, Schltr., to the section *Diphyllae*, and should be placed in the neighbourhood of *H. Aitchisoni*, Rchb. f. It is at once easily distinguished by the very dense, cylindrical spikes of smaller flowers.

26214

Habenaria Forrestii, Schltr. Sp. nov. Plate lxxix.

Terrestris, erecta, gracilis, 20–25 cm. alta; tuberibus anguste oblongoideis; radicibus simplicibus flexuosis, puberulis; caule basi 2–3-foliato, caeterum vaginis paucis, acuminatis, distantibus obsesso, tereti, glabro; foliis erecto-patentibus linearibus,

acutis, glabris, 2–6 cm. longis, medio fere 2–2·5 cm. latis; spica sublaxe multiflora, usque ad 12 cm. longa; bracteis erectis, ovato-lanceolatis, acuminatis, ovario plus duplo brevioribus; floribus in genere inter minores, viridibus; sepalo intermedio, erecto, ovato, obtuso, glabro, vix 0·3 cm. longo, lateralibus deflexis, falcatis, anguste oblongo-ligulatis, obtusis, glabris, sepalo intermedio aequilongis, petalis oblique ovato-lanceolatis, obtusis, sepalis paululo brevioribus; labello ligulato, obtuso, simplici, glabro ante ostium calcaris carnoso-incrassato, deflexo, petalis aequilongo, calcare cylindrico glabro, incurvulo, ovario subaequilongo; anthera apice leviter retusa, canalibus abbreviatis; rostello semiorbiculari, parvulo; processibus stigmatiferis canales antherarum paulo superantibus, ovario cylindraceo, glabro, c. 0·7 cm. longo.

"Plant of 9–12 inches. Root tuberous. Flowers green, fragrant. Dry mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 2875.

By the first aspect this species reminded me of *H. natalensis*, Rchb. f., with which it has somewhat the habit and the look of the flowers in common, but in the parts of its flowers it is very different, and by them belongs to a very different group in the neighbourhood of *H. leptocaulon*, Hook. f.

Habenaria Orchidis, (Lindl.) Hook. f. in Fl. Brit. Ind. vi, p. 142 (1890).

"Plant of 9–14 inches. Flowers white or pale pink, strongly fragrant. Grassy openings in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 11–12,000 ft. July 1906." G. Forrest. No. 2650.

Habenaria pectinata, Don, Prodr. p. 24; Finet in Rev. Génér. Bot. xiii (1901), p. 531.

"Plant of 1–2 ft. Root tuberous; flowers creamy or greenish-white, fleshy. Boggy situations by streams along the base of the eastern flank of the Lichiang Range. Lat. 27° 10′ N. Alt. 8500–9000 ft. August 1906." G. Forrest. No. 2807, No. 4884.

Satyrium setchuenicum, Kränzlin in Engler's Botan. Jahrb. xxix (1901), p. 266.

"Plant of 6–10 inches. Root tuberous, flowers rose-pink, fragrant. Dry, grassy slopes on the eastern flank of the Lichiang

Range. Lat. 27° 25′ N. Alt. 9–11,000 ft. September 1906." G. Forrest. No. 3053.

"Plant of 9–18 inches. Flowers rose-pink, fragrant. Dry pastureland, and on humus-covered boulders on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. July–August 1906." G. Forrest. No. 4882.

Satyrium nepalense, Don, Prodr. Fl. Nepal, p. 26; I.F.S. iii, p. 63.

"Plant of 6–9 inches. Flowers rose-purple, faintly fragrant. Grassy openings in mixed forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. June 1906." G. Forrest. No. 4876.

Pogonia yunnanensis, Finet in Bull. Soc. Bot. France, xliv (1897), p. 419, t. 13, figs. K–F; I.F.S. iii, p. 47.

"Plant of 3–6 inches. Flowers rose-purple. Moist mountain meadows on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9000 ft. June 1906." G. Forrest. No. 4854.

Cephalanthera falcata, Lindl. Gen. et Sp. Orch. p. 412; I.F.S. iii, p. 48.

"Plant of 9–15 inches. Flowers pure white, non-fragrant. Shady, rocky situations amongst scrub on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 9–10,000 ft. May 1906." G. Forrest. No. 2188.

"Plant of 9–18 inches. Flowers greenish-white. Shady, damp situations in mixed and pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. May–June 1906." G. Forrest. No. 4870.

Epipactis Royleana, Lindl. Gen. et Sp. Orch. p. 461; I.F.S. iii, p. 49.

"Plant of 1–3 ft. Flowers dark purplish-maroon. Dry, shady, stony situations on the margins of pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10,000 ft. July 1906." G. Forrest. No. 4873.

"Stony, open situations in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 11,000 ft. June 1906." G. Forrest. No. 2430, partly.

Epipactis consimilis, Don, Prodr. Fl. Nepal. p. 28; I.F.S. iii, p. 48.

"Plant of 10–14 inches. Flowers green. Dense, shady thickets in side valleys on eastern flank of the Lichiang Range. Lat. 27° 18′ N. Alt. 11,000 ft. June 1906." G. Forrest. No. 2454.

No. 2430, partly.

Neottia micrantha, Lindl. Gen. et Sp. Orch. p. 458; I.F.S. iii, p. 40.

"Plant of 6–14 inches. Flowers pale brown, segments of perianth with scarious segments. In very dense, shady pine forests on a chalky soil on the eastern flank of the Lichiang Range. Lat. 27° 12′. Alt. 10,500–11,000 ft. June 1906." G. Forrest. No. 2274.

Neottia grandiflora, Schltr. Sp. nov. Plate lxxx.

Terrestris, erecta, saprophytica, 20–32 cm. alta; radicibus numerosis, carnosulis, flexuosis, glabratis; caule crassiusculo, tereti, apicem versus sparsim papilloso, vaginis 4–5 alte amplectentibus obtusis obsesso, vaginis 2 superioribus suboppositis; racemo dense multifloro, cylindrico, usque ad 17 cm. longo, 3–3·5 cm. diametiente; bracteis erecto-patentibus, ellipticis obtusis, ovarium paulo superantibus, extus sparsim papillosis; rhachi papillosa; floribus in genere magnis, erecto-patentibus; sepalis extus sparsim papillosis vel subglabris, 0·6 cm. longis, intermedio oblongo, subacuto, lateralibus falcato-ellipticis apiculatis, margine anteriore medio dilatatis; petalis oblique linearibus vel lineari-ligulatis, apicem versus sublatioribus obtusiusculis, marginibus revolutis apice irregularibus, sepalis subaequilongis; labello circuitu cuneato-obovato, 1·5 cm. longo, supra medium usque ad 1 cm. lato, usque ad medium bilobo, lobis oblique oblongis obtusis, margine exteriore plus minusve subcrenato-irregularibus, minutissime papillosis, callo bifido parvulo in basi labelli, linea media incrassata interjecta; columna leviter arcuata, basin versus paulo dilatata, glabra, c. 0·5 cm. longa; ovario clavato, sparsim papilloso, c. 0·7 cm. longo.

"Plant of 9–14 inches. Perianth fleshy, segments rich olive-green, bordered by a lighter shade. Damp, shady situations in mixed forests on the eastern slope of the Lichiang Range. Lat. 27° 20′ N. Alt. 10–10,500 ft. August 1906." G. Forrest, No. 2652.

From all other species this is well distinguished by its large flowers and the broad lobes of the labellum.

Goodyera Schlechtendaliana, Rchb. f. in Linnaea, xxii (1849), 861 ; I.F.S. iii, p. 46.

"Plant of 3–7 inches. Flowers light green, fragrant. Stony situations in pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. July 1906." G. Forrest. No. 4874.

Spiranthes chinensis, (Pers.) Ames. *S. australis,* Lindl. ; I.F.S. iii, p. 41.

"Plant of 9–15 inches. Flowers white. Grassy situations along the base of the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 9000 ft. September 1906." G. Forrest. No. 2892.

"Plant of 4–6 inches. Flowers pure waxy white. Sheltered situations amongst rocks on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 10–11,000 ft. September 1906." G. Forrest. No. 3056.

"Plant of 6–12 inches. Flowers rose. Dry mountain pasture on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. May–July 1906." G. Forrest. No. 4865.

"Plant of 3–9 inches. Flowers pale rose or greenish-white. Pastureland on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. June–July 1906." G. Forrest. No. 4869.

"Plant of 9–15 inches. Flowers pink and white. Dry pastureland on the dividing range between the Hoching-cho and Lang-Kung Hsien valley. Lat. 26° 30′. Alt. 11–12,000 ft. August 1906." G. Forrest. No. 2883.

Bletilla hyacintha, (Sm.) Rchb. f. in Botan. Zeit. xxxvi (1878), 75. *Bletia hyacinthina,* R. Br. ; I.F.S. iii, 19.

"Plant of 8–16 inches. Flowers rose-purple, marked a deeper shade. Dry, grassy situations on the margins of thickets on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. August–September 1906." G. Forrest. No. 4891.

Arundina chinensis, Bl. Bijdr. p. 402 ; I.F.S. iii, 27.

"Plant of 1–2 ft. Flowers white and rose-lavender. Dry, grassy situations on the hills forming the eastern boundary of the Lichiang valley. Lat. 27° 15′ N. Alt. 9–10,000 ft. September 1906." G. Forrest. No. 3016.

"Plant of 1–2 ft. Flowers bright purplish-rose and yellow.

Dry, open pastureland on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–9000 ft. August 1906." G. Forrest. No. 4892.

Trichosma suavis, Lindl. in Bot. Reg. (1842), t. 21; Hook. f., Fl. Brit. Ind. v, p. 827.

"Plant of 10–15 inches. Flowers purple and yellow. Pine forests in the Shweli valley near Lung Ling. Lat. 24° 35′ N. Alt. 6–7000 ft. March 1906." G. Forrest. No. 4976.

Not recorded from China so far.

Coelogyne corymbosa, Lindl., Fol. Orch., *Coelog.*, p. 7; I.F.S. iii, p. 22.

"Plant of 4–6 inches. Flowers yellow, with brown markings, fragrant. On moss-covered trees in mixed forests in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. July–August 1906." G. Forrest. No. 4880.

Pleione grandiflora, Rolfe, sub *Coelogyne* in I.F.S. iii, p. 22.

"Plant of 2–4 inches. Flowers pure white, with a few rich lake markings. On moss-covered cliffs and boulders in shady side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. April–May 1906." G. Forrest. No. 4860.

13259 **Pleione Forrestii,** Schltr. Sp. nov. Plate lxxxi.

Terrestris, erecta, humilis, usque ad 15 cm. alta, rhizomate valde abbreviato; radicibus filiformibus elongatis, flexuosis, glabratis; pseudo-bulbis oblique sublageniformibus, apice annulo sicco terminatis, 2–2·5 cm. altis, basi usque ad 1 cm. diametientibus, unifoliatis; foliis in speciminibus omnibus nondum evolutis, post evolutionem mox caducis; floribus proteranthiis in scapis unifloris, speciosis, illis *P. pugonioides,* Rolfe fere aequi-magnis; sepalis petalisque oblanceolato-ligulatis, obtusis, glabris, plurinervis, 4 cm. longis; labello basi columnae marginibus adnato, circuitu perlate rhombeo, obscure trilobato, c. 0·4 cm. longo, medio fere c. 3·2 cm. lato, lobis lateralibus rotundatis abbreviatis, antice margine breviter lacerato-fimbriatis, lobo intermedio multo majore subquadrato antice exciso, margine lacerato-fimbriato, carinis 7 leviter undulatis e basi labelli usque in basin lobi intermedii decurrentibus antice paulo ampliatis, nervo medio vix incrassato in basi lobi intermedii in lamellam brevem

satis altum producto; columna gracili, leviter curvata, c. 3 cm. longa, apicem versus dilatata, clinandrio lobulato; ovario clavato, glabro, pedicello incluso c. 1·5 cm. longo.

"Plant of 2–4 inches. On moss-covered boulders and cliffs in shady side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. April–May 1906." G. Forrest. No. 4859.

According to Mr. Forrest the flowers of this remarkable species are bright orange, with brown markings. It must then be a very fine species resembling certain forms of *Crocus* at first sight. Its nearest ally seems to be *P. grandiflora*, Rolfe, but in this the crests of the lip are quite different.

Pleione Delavayi, Rolfe, sub *Coelogyne*, in I.F.S. iii, p. 21.

"Plant of $1\frac{1}{2}$–4 inches. Flowers bright purplish-rose, with darker markings. Open mountain pasture on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7500–9000 ft. May–July 1906." G. Forrest. No. 4858.

Pleione Henryi, Rolfe, sub *Coelogyne*, in Kew Bull. (1896), p. 195; I.F.S. iii, p. 22.

"Plant of 4–8 inches. Flowers, appearing before foliage is developed, magenta-rose, with darker markings on labellum. Crevices of cliffs and dry, stony situations on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 9–10,500 ft. June 1906." G. Forrest. No. 2346.

Pleione yunnanensis, Rolfe, sub *Coelogyne*, in I.F.S. iii, p. 23.

"Plant of 3–4 inches. Flowers bright rose. Dry mountain pasture on the eastern flank of the Salwin valley. Lat. 25° N. Alt. 7,000 ft. April 1906." G. Forrest. No. 5012.

Pleione sp.

Imperfect specimen. No flowers.

"Plant of 2–4 inches. Flowers brown. On trunks of trees in mixed forests in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. July 1906." G. Forrest. No. 4871.

Pleione sp.

Imperfect specimen. No flowers.

"Plant of 2–4 inches. Flowers olive-brown. On trees in mixed forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. August 1906." G. Forrest. No. 4889.

Bulleyia, Schltr. Gen. nov.

Sepala oblonga, lateralia basi ampliata, obliqua. Petala sepalis similia oblonga. Labellum calcaratum e basi concava in laminam circuitu oblongam supra medium subarticulato-constrictam antice sursum dilatatam expansam, petalis fere aequimagnum, calcare curvato-porrecto, cylindrico. Columna gracilis, apicem versus dilatata, clinandrio more tribus ampliato, margine denticulato. Stigma marginatum; anthera subreniformi-cucullata, brevis. Pollinia 4 compressa, oblique obovata, basi cohaerentia. Ovarium breve, subsessile.

Species una adhuc nota yunnanensis.

This genus, which seems to be nearest allied to *Pholidota*, Lindl., is very remarkable in the group of the *Coelogyninae* by the presence of a spur at the base of the labellum, a character which as yet has never been observed in any genus of this affinity. From *Pholidota* it is besides distinguished by the slender column.

It gives me great satisfaction to be able to dedicate this genus to Mr. A. K. Bulley, who by sending out such an able collector as Mr. G. Forrest has greatly advanced our knowledge of the Flora of the more unknown parts of China.

26214

Bulleyia yunnanensis, Schltr. Sp. nov. Plate lxxxii.

Epiphytica, erecta, usque ad 35 cm. alta; rhizomate abbreviato, dense pseudobulbis obsesso; radicibus filiformibus, elongatis, flexuosis, villosis; pseudobulbis ovoideis, lateraliter compressis, mox rugoso-sulcatis, c. 4 cm. altis, infra medium c. 2 cm. latis, bifoliatis; foliis erecto-patentibus erectisve petiolatis, lamina lanceolata, acuminata, basi sensim angustata, c. 20 cm. longa, medio fere c. 2·5 cm. lata, petiolo sulcato, c. 5 cm. longo; scapo cum foliis juvenilibus synantho inflorescentia inclusa c. 30 cm. longo, pedunculo, bracteis paucis ad basin inflorescentiae imbricatis exceptis, ebracteato, gracili, tereti, glabro; rhachi valde flexuoso-racemo sublaxe 10–15–floro, bifario; bracteis persistentibus patentibus amplis, suborbicularibus apiculatis, floribus paulo brevioribus; floribus inversis, bene magnis, flavidis, sepalis ovato-oblongis, apiculatis, glabris, c. 2 cm. longis, lateralibus obliquis basi margine anteriore ampliatis; petalis oblique elliptico-oblongis subapiculatis glabris, sepalis subaequilongis sed paulo latioribus; labello circuitu oblongo, basi concavo, supra medium subito constricto et antice in lobum obreniformem emarginatum expanso, nervis 3 carinato-incrassatis in isthmo, petalis aequilongo, calcare cylindraceo, arcuato-porrecto, obtusiusculo, inter sepala abscondito, dimidium labelli subattingente; columna generis, glabra, 1·2 cm. longa; ovario clavato c. 0·4 cm. longo, glabro,

"Plant of 9–15 inches. Flowers yellowish. On trunks of trees and humus-covered boulders in mixed forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. July–August 1906." G. Forrest. No. 4879.

This remarkable plant at first sight has the appearance of a large flowered species of *Pholidota*, as the spur of the labellum is hidden between the sepals. The presence of a genus with a spurred labellum is most unexpected in the group *Coelogyninae*, as hitherto, with the exception of small concavities at the base of the labellum, nothing like it is known in this affinity.

26217

Microstylis yunnanensis, Schltr. Sp. nov. Plate lxxxiii.

Terrestris, erecta 10–23 cm. alta; rhizomate abbreviato, bulbis ut videtur subterraneis, approximatis, oblique ovoideis, vaginis mox in fibros solutis circumdatis, usque ad 1·5 cm. longis, infra medium 0·7 cm. diametro; foliis vulgo 2, interdum singulis, erecto-patentibus, petiolo scapum basi alte vaginantibus, lamina oblonga vel elliptica, obtusiuscula, utrinque glabra, 2·5–5 cm. longa, 1·5–2·5 cm. medio lata, petiolo lato usque ad 4 cm. longo; scapo erecto, stricto, folia bene superante, pedunculo leviter angulato, glabro, racemo subdense multifloro, cylindraceo, usque ad 11 cm. longo, 1·6–1·8 cm. diametiente; bracteis erecto-patentibus lanceolatis acuminatis, ovario duplo-brevioribus; floribus illis *M. muscifera*, Ridl. similibus sed multo majoribus, erecto-patentibus, glabris, sepalis lanceolatis longe acuminatis c. 0·5 cm. longis, lateralibus obliquis; petalis oblique lineari-lanceolatis, longe acuminatis, 0·3 cm. longis; labello e basi auriculato-cordata ovata, infra medium angustato, lanceolato, acuminato, 0·5 cm. longo, intus carinis 2 carnosulis e basi usque ad marginem infra medium labelli decurrentibus, nervis 3 medianis in basi labelli subincrassatis; columna brevi crassiuscula, anthera ovata obtusa; ovario clavato, glabro, pedicello incluso c. 0·6 cm. longo.

"Plant of 3–9 inches. Flowers greenish-yellow, faintly fragrant. Mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 11–12,000 ft. July 1906." G. Forrest. No. 2627.

Undoubtedly an ally of *M. muscifera*, Ridl., but easily distinguished by the larger flowers with longer drawn out segments, and the form of the labellum.

Oreorchis patens, Lindl. in Journ. Linn. Soc. iii (1859), 27.

"Plant of 6–9 inches. Flowers, sepals and petals brownish, labellum yellowish-green, spotted reddish-brown, fragrant.

Open pine forests on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 10–11,000 ft. June 1906." G. Forrest. No. 2287.

"Flowers darker than in No. 2287. Plant of 6–10 inches. Flowers brownish-green, labellum spotted reddish-brown, fragrant. On humus-covered boulders in open situations on limestone drift on the eastern flank of the Lichiang Range. Lat. 27° 12′. Alt. 11,000 ft. June 1906." G. Forrest. No. 2288.

Oreorchis micrantha, Lindl. in Journ. Linn. Soc. iii, p. 27; Hook. f. in Fl. Brit. Ind. v (1890), p. 709.

"Plant of 9–14 inches. Flowers appearing before foliage, olive-brown, labellum lighter in colour, and spotted purple, fragrant. Very moist, grassy, shady situations by side of stream on eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11,000 ft. June 1906." G. Forrest. No. 2472.

Like the former, not recorded before from China.

Eulophia Faberi, Rolfe in Kew Bull. 1896, p. 198; I.F.S. iii, p. 28.

"Plant of 12 inches. Petals and sepals brownish-pink, labellum pink, with darker markings. Dry, stony ground at the south end of the Lang Kung Hsien valley near Kai-Hsi-dsi. Lat. 26° 10′ N. Alt. 7500 ft. April 1906." G. Forrest. No. 2093.

2619

Calanthe undulata, Schltr. Sp. nov. Plate lxxxiv.

Terrestris, erecta, c. 40 cm. alta; rhizomate abbreviato; radicibus filiformibus elongatis, flexuosis, pilosis; foliis basilaribus c. 3 erecto-patentibus ellipticis, acuminatis, plicatis, basi subpetiolato-angustatis, utrinque glabris, sub anthesi (nondum omnino evolutis, usque ad 20 cm. longis, medio fere usque ad 6 cm. latis; scapo erecto, folia bene superante dimidio superiore laxe plurifloro (c. 17) sparsim puberulo; bracteis ellipticis, acutis, patentibus, ovario pedicellato multo brevioribus; floribus mediocribus, erecto-patentibus; sepalis patentibus, c. 1·5 cm. longis, extus minute puberulis, intermedio latius ovali, acuto, lateralibus falcato-ellipticis, subacutis, petalis oblique obovato-spathulatis, obtusis, sepalis paululo brevioribus; labello e basi trilobo, petalis aequilongo, lobis lateralibus basalibus divergentibus subreniformi-flabellatis, margine undulatis, lobo medio late reniformi antice alte bifido, margine undulato, 0·7 cm. longo infra medium c. 1·2 cm. lato, e basi lamellis 3 altis, crenulatis, hinc inde lateraliter dentatis usque infra apicem ornato; sacco basalio oblongoideo-hemisphaerico, perbrevi extus puberulo

basibus sepalorum abscondito; columna brevi, crassiuscula, anthera late ovato-cucullata, glabra; ovario subclavato, puberulo, pedicello incluso c. 1·7 cm. longo.

"Plant of 1–1½ ft. Non-fragrant. Shady, dry situations amongst shrubs in a side valley on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 9–10,000 ft. June 1906." G. Forrest. No. 2345.

A very distinct species, easily recognised by the form of the labellum, and the short saccate form of the base of the lip. Mr. Forrest gives the colour of the flowers as follows: "Petals and sepals dull yellow. Rostellum and labellum deep maroon."

Calanthe Delavayi, Finet in Bull. Soc. Bot. Franch. xlvi, p. 434. (*C. coelogyniformis,* Kränzl.)

"Plant of 6–12 inches. Flowers rose-purple. Moist, shady situations in thickets and mixed forests in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 9000 ft. June 1906." G. Forrest. No. 4872.

"Plant of 9–16 inches. Flowers of a pale watery whitish-rose, veined and marked a deeper shade of rose, non-fragrant. Stony, moist situations in open pine forests on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 10–11,000 ft. June 1906." G. Forrest. No. 2496.

Calanthe bucciniferа, Rolfe in Journ. Linn. Soc., Bot. xxix (1892), p. 318; I.F.S. iii, p. 25.

"Plant of 9–12 inches. Flowers rich rose-purple, labellum a darker shade of same, non-fragrant. Amongst and on moss-grown boulders in dense shady pine forests on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11,000 ft. June 1906." G. Forrest. No. 2495.

Spathoglottis Fortunei, Lindl. Gen. et Sp. Orch. p. 120; I.F.S. iii, p. 18.

"Plant of 10–15 inches. Flowers bright yellow and chocolate brown. Dry, clayey pasture on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 7–9000 ft. August 1906." G. Forrest. No. 4883.

Dendrobium clavatum, Wall. Cat. n. 2004; I.F.S. iii, p. 10.

"Plant of 1–1½ ft. Flowers deep orange, with orange-brown markings. Dry ledges and crevices of cliffs in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–9000 ft. July–August 1906." G. Forrest. No. 4881.

Cymbidium grandiflorum, Griff. Not. iii, p. 342; I.F.S. iii, p. 30.

"Plant of 1–3 ft. Flowers yellowish-green, with brown markings, very fragrant, with a strong vanilla-like perfume. In thickets and mixed forests generally on oak, on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 7–9000 ft. August –October 1906." G. Forrest. No. 4857.

Within China, this had not been recorded north of Meng-tze.

Cymbidium longifolium, Don, Prodr. Fl. Nepal. p. 36; I.F.S. iii, p. 31.

"Flowers green, with purple markings, fragrant. Ledges and clefts of cliffs on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. July–August 1906." G. Forrest. No. 4856.

Cymbidium virescens, Lindl. in Bot. Reg. 1838, Misc. p. 37.

Yunnan, 1904. G. Forrest. No. 328.

Cyperorchis elegans, (Lindl.) Bl. Rumph. iv, t. 47. Hook. f., in Flor. Brit. Ind. vi (1894), p. 14.

"Growing at China Inland Mission, Talifu. Alt. 6500 ft. Yunnan, 1904." G. Forrest. No. 335.

"Plant of 1½–2 ft. Flowers dirty greenish-yellow, corolla thick, fleshy. Ledges of moist, shady rocks, overhanging streams. Side valleys of the Salwen, Salwen-Irrawadi divide. Lat. 26° N. Alt. 6000 ft. October 1905." G. Forrest. No. 964.

Subtropical Himalaya, Khasia and Munnipore; not recorded from China so far.

Saccolabium distichum, Lindl. in Journ. Linn. Soc. iii, p. 36. Hook. f., in Fl. Brit. Ind. vi (1894), p. 64.

"Procumbent plant of 3–9 inches. Flowers greenish-white. Moist, shady situation on rocks in side valleys on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 10–11,000 ft. October 1906." G. Forrest. No. 3101.

"Succulent plant of 3–4 inches. Forming tufts on dry ledges of cliffs, moss-covered rocks and trees in shady situations in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. July–August 1906." G. Forrest. No. 4722.

This is known from Sikkim to Munnipore, but recorded up to 8000 ft. only. It is new for China.

LIST OF PLATES.

Illustrating Dr. Rudolf Schlechter's Paper on Species of Orchidaceae collected by George Forrest in Yunnan and Eastern Tibet.

The plates are taken from photographs by Mr. R. Adam of dried specimens in the Herbarium of the Royal Botanic Garden, Edinburgh.

PLATE LXXVI. Herminium ophioglossoides, Schltr. Sp. nov.
LXXVIIA. Herminium Forrestii, Schltr. Sp. nov.
LXXVIIB. Habenaria diplonema, Schltr. Sp. nov.
LXXVIII. Habenaria diceras, Schltr. Sp. nov.
LXXIX. Habenaria Forrestii, Schltr. Sp. nov.
LXXX. Neottia grandiflora, Schltr. Sp. nov.
LXXXI. Pleione Forrestii, Schltr. Sp. nov.
LXXXII. Bulleyia yunnanensis, Schltr. Sp. nov.
LXXXIII. Microstylis yunnanensis, Schltr. Sp. nov.
LXXXIV. Calanthe undulata, Schltr. Sp. nov.

Herminium ophioglossoides, *Schltr.*

PLANTS OF E. TIBET AND S.W. CHINA.
GEORGE FORREST
A. K. BULLEY & NEES, NESTON, CHESHIRE.

Habenaria diglonema, Schltr.

PLANTS OF E. TIBET AND S.W. CHINA.
GEORGE FORREST
A. K. BULLEY & NEES, NESTON, CHESHIRE.

Herminium Forrestii, *Schltr.*

Habenaria diceras, *Schltr.*

Habenaria Forrestii, *Schltr.*

PLANTS OF E. TIBET AND S.W. CHINA.

COLLECTED BY A. K. BULLEY OF NESS NESTON CHESHIRE

Neottia grandiflora, *Schltr.*

Pleione Forrestii, *Schltr.*

Bulleyia yunnanensis, *Schltr.*

Microstylis yunnanensis, *Schltr.*

Calanthe undulata, *Schltr.*

Plantae Chinenses Forrestianae.

Plants discovered and collected by George Forrest during his first exploration of Yunnan and Eastern Tibet in the years 1904, 1905, and 1906.

Enumeration and Description of Species of Sedum.

BY

RAYMOND HAMET,
Paris.

With Plates LXXXV.–LXXXVI.

Sedum multicaule, Wallich.

"Hillsides on Thupa and Hopa valleys, Yangtse and Mekong divide between Pung tzu la and Yeh Chih. Alt. 8000–9000 ft. September 1904." G. Forrest. No. 207.

"W. Yunnan, on boulders in moist, open situations in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9000–10,000 ft. September 1906. Plant of 2–5 inches. Flowers yellowish-green." G. Forrest. No. 5051.

"Yunnan, rocks near summit of Nin Chang pass and on Chung Tien plateau. Alt. 9000–13,000 ft. 1904." G. Forrest. No. 188.

"Yunnan, ledges and crevices of cliffs and humus-covered boulders, on eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10,000–11,000 ft. September 1906." G. Forrest. No. 2896.

Sedum Engleri, Raymond Hamet, var. **Forresti.** Var. nov.

Sepalis infra insertionem in calcar productis; squamis paulo longioribus quam latioribus.

"Tibet, on rocks Shupa valley, Yangtse-Mekong divide. Alt. 8000 ft. 1904." G. Forrest. No. 316.

Sedum indicum, Raymond Hamet, var. **Forresti.** Var. nov.

Foliis inferioribus et mediis oppositis, superioribus alternis, omnibus ovato-suborbicularibus latissimis acutis.

[Notes, R.B.G., Edin., No. XXIV., January 1912.]

"N.W. Yunnan, on dry clefts of rocks and shady cliffs on the Yako ridge valley of the Salwen, Salwen-Irrawadi divide. Plant of 1–2 ft. Flowers yellowish-green. Lat. 26° 30′ N. Alt. 7000–9000 ft. November 1905." G. Forrest. No. 924.

Sedum indicum, Raymond Hamet, var. **genuinum,** Raymond Hamet.

"N.W. Yunnan, on humus-covered boulders and ledges of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11,000–12,000 ft. September 1906. Plant of 6–10 inches. Flowers ruddy green." G. Forrest. No. 3018.

Sedum drymarioides, Hance, var. **stellariaefolium,** Raymond Hamet.

"Yunnan, wet rocks on Nin Chang pass between Yangtse and Chung Tien plateau. Alt. 9000–10,000 ft. 1904." No. 197.

Sedum Balfouri,* Raymond Hamet. Sp. nov. Plate lxxxv.

Planta perennis foliis inferioribus rosulatis, sessilibus, in calcar non productis, planis, glabris, lineari-obovatis, basi latissimis paulo dilatatis, apice sensim attenuatis mucronatis, marginibus integris ciliatis. Scapi plures extrarosulares, basi curvati, deinde erecti, robustiusculi, simplices, glabri. Scaporum folia alterna, sessilia, infra insertionem in calcar producta, plana, glabra, obovato-lanceolata, integra, apice acuta, marginibus ciliatis. Inflorescentia corymbiformis. Bracteae foliis similes sed minores. Pedicelli glabri, calyce breviores. Flores satis numerosi. Calyx glaber, segmentis 5, tubo longioribus, basi non productis, longe deltoideis, marginibus integris, acutis, longioribus quam latioribus. Corolla glabra, calyce longior, segmentis 5 oblongis, marginibus integris, apice acutiusculis, mucronatis, longioribus quam latioribus. Stamina 10; filamenta oppositipetala infra corollae medium inserta; antherae corollae medium superantes. Carpella 5, multiovulata, glabra, in stylos carpellis breviores attenuata. Squamae 5, lineares obtusae multo longiores quam latiores. Folliculi 5, multiseminati, erecti, lateribus internis non gibbosis. Semina. . . .

Scapi 25–31 cm. longi. Folia inferiora 23–25 mm. longa, 6·60–8 mm. lata. Scaporum folia et bractearum calcar 0·90–2·80 mm. longum; lamina 6·40–22 mm. longa, 1·25–6·40 mm.

* Herbarii Edinensis Crassulaceis a Professor Bayley Balfour mihi amabiliter communicatis, quae speciei hujus botanici nomen imposui, ut quam gratissimus erga eum cognoscerer.

lata. Inflorescentia 40–43 mm. longa, 50–60 mm. lata. Pedicelli 0·80–1 m. longi. Calycis pars concreta 1 mm. longa ; pars libera 2·60–3 mm. longa, 1·15–1·20 mm. lata. Corollae pars concreta 0·10 mm. longa ; pars libera 5·40–5·50 mm. longa, 2·05–2·20 mm. lata. Staminum alternipetalorum filamentorum pars concreta 0·10 mm. longa ; pars libera 3·60 mm. longa, 0·60 mm. lata. Staminum oppositipetalorum filamentorum pars concreta 0·60 mm. longa ; pars libera 2·80 mm. longa, 0·60 mm. lata. Antherae 1·20 mm. longae, 0·60 mm. latae. Carpellorum pars concreta 0·90 mm. longa ; pars libera 2·40 mm. longa. Styli 1·50 mm. longi. Squamae 1 mm. longae, 0·12 mm. latae.

"Tibet, Kari pass, Yangtse-Mekong divide, on rocks. Alt. 9000–10,000 ft. 1904." G. Forrest. No. 196.

Obs :—Haec species valde insignis ab omnibus adhuc descriptis Sedis maxime distat.

Sedum obtusipetalum, Franchet.

"Yunnan, valley of the Yangtse, between Chu Tien and Shi Ku. Alt. 7000 ft. 1904." G. Forrest. No. 199.

Sedum yunnanense, Franchet, var. **valerianoides,** Raymond Hamet.

"N.W. Yunnan, ledges of shady cliffs and on humus-covered boulders on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 10,000–11,000 ft. June 1906. Plant of 12–24 inches. Flowers green." G. Forrest. No. 2458.

Sedum yunnanense, Franchet, var. **Forresti,** Raymond Hamet.

Var. nov.

Foliis per 4 verticillatis, sublineari-oblongis, sublobatis, lobis paucis ; inflorescentia paniculiformi, pauciflora, satis laxa, pedunculis inferioribus superioribus non ramosioribus ; carpellis erectis.

"Yunnan, crevices and ledges of cliffs and on limestone drift in pine forests, eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10,000–11,500 ft. June 1906. Plant of 8–16 inches. Foliage deep crimson. Flowers red, anthers greenish-yellow." G. Forrest. No. 2384.

Sedum primuloides, Franchet.

"Yunnan, dry rocks on base of Lichiang peak, Lichiang valley. Alt. 12,000 ft. 1904. Flowers white." G. Forrest. No. 200.

Sedum Oreades, Raymond Hamet.

"W. Yunnan, on moss-covered boulders in open situations on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9000–11,000 ft. August 1905. Plant of 1½–3 inches. Flowers yellow." G. Forrest. No. 5052.

"Yunnan, ledges of cliffs and on humus-covered boulders on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11,000–12,000 ft. September 1906." G. Forrest. No. 3051.

Pro sinica flora planta nova.

Sedum Beauverdi, Raymond Hamet.

"W. Yunnan, on boulders and cliffs on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 12,000–13,000 ft. Plant of 1–2 inches. July–September 1906." G. Forrest. No. 4688.

Sedum trullipetalum, Hook f. et Thoms.

"W. Yunnan, on moss-covered boulders, dry, shady situations in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10,000–11,000 ft. August 1906. Plant of 2–3 inches. Flowers brassy yellow." G. Forrest. No 5050.

3537 **Sedum Forresti,** Raymond Hamet. Sp. nov. Plate lxxxvi.

Planta annua, steriles caules non edens. Radices fibratae. Caules floriferi erecti, graciliusculi, ramosi, glabri. Folia alterna, sessilia, infra insertionem in calcar producta ; calcar integrum, obtusum ; lamina obovato-linearis vel obovato-oblonga, integra, glabra, obtusa. Inflorescentia corymbiformis, satis laxa. Flores pauci. Bracteae foliis similes sed eis minores. Pedicelli calyce breviores vel illi subaequales. Calyx glaber, segmentis 5, infra insertionem in calcar productis, obovato-oblongis, marginibus integris, apice obtusis, longioribus quam latioribus. Corolla glabra, calyce paulo longior vel paulo brevior, segmentis 5, tubo multo longioribus, obovato-oblongis, marginibus integris, obtusis, late mucronatis, longioribus quam latioribus. Stamina 10, filamenta oppositipetala infra corollae medium inserta ; antherae superiores petalorum apicem paulo superantes. Carpella 5, pauciovulata, glabra, in stylos carpellis breviores attenuata, placentis a gracili ligamine secundum carpellorum margines disposito constitutis. Squamae 5, subteretes, apice et basi levissime dilatatae, longiores quam latiores. Folliculi 5, pauciseminati, erecti, lateribus internis non gibbosis. Semina . . .

Planta 5–7 cm. longa. Foliorum et bractearum calcar

0·30–0·80 mm. longum ; lamina 4·4–9·7 mm. longa, 1·4–3·25 mm. lata. Pedicelli 4·80–9·25 mm. longi. Sepalorum calcar 0·40–0·90 mm. longum ; lamina 3·8–5·5 mm. longum, 1·2–1·8 mm. latum. Corollae pars concreta 0·05 mm. longa ; pars libera 4·60–5·30 mm. longa, 1·80–2·55 mm. lata. Staminum alternipetalorum filamentorum pars concreta 0·05 mm. longa ; pars libera 4–4·60 mm. longa, 0.50–0·60 mm. lata. Staminum oppositipetalorum filamentorum pars concreta 0·60–0·70 mm. longa ; pars libera 3·80–4·50 mm. longa, 0·40–0·45 mm. lata. Antherae 1–1·10 mm. longae, 0·70–0·80 mm. latae. Carpellorum pars concreta 0·80–1·30 mm. longa ; pars libera 2·90–3·25 mm. longa. Styli 1·70–1·80 mm. longi. Squamae 1·30–1·40 mm. longae, 0·20–0·30 mm. latae.

"N.W. Yunnan, dry, shady situations on cliffs and humus-covered boulders on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10,000–11,000 ft. August 1906. Plant of 2–3 inches. Flowers brassy yellow." G. Forrest. No. 2808.

Obs. A *Sedo glaciali* haec species :—1. sepalis obtusis et non acutis leviter cuspidatis ; 2. petalis proportionaliter latioribus ; 3. placentis a gracili ligamine secundum carpellorum margines disposito constitutis, et non a mole semiorbiculari in carpellorum laterum parte inferiore disposito constitutis differt.

A *Sedo obtusipetalo* :—1. sepalis obovato-oblongis et non sublinearibus vel ovato-linearibus ; 2. petalis proportionaliter latioribus ; 3, antheris petalorum apicem et non petalorum medium superantibus ; 4. squamis apice vix dilatatis, multo longioribus quam latioribus, et non apice valde dilatatis, vix longioribus quam latioribus, distat.

3531 **Sedum trifidum,** Wallich, var. **Balfouri,** Raymond Hamet. Var. nov.

Foliis in caulis dimidiam vel tertiam partem superiorem dispositis, petiolatis, lamina ovato-oblonga, ovato-orbiculari vel orbiculari, crenata, crenis paucis ; sepalis ovatis vel deltoideis ; petalis marginibus plus minusve erosis.

"Yunnan, growing on damp cliffs and the roots of trees in valleys of the Mekong-Yangtse divide between Pang tze la and Yeh Chih. Alt. 9000–13,000 ft. September 1904." G. Forrest. No. 787 C D E F G.

3540 **Sedum trifidum,** Wallich, var. **Forresti,** Raymond Hamet. Nova var.

Foliis caulis apice aggregatis, petiolatis, lamina orbiculari vel ovato-orbiculari vel ovata, crenata, crenis paucis ; sepalis linearibus ; petalis marginibus integerrimis.

"Yunnan, moist rocks on pass between Teng Chuan valley and Sung Kwei. Alt. 8000–11,000 ft. September 1904. Flowers greenish-white." G. Forrest. No. 212.

"W. Yunnan, on rocks and moss-covered trees, moist, shady situations in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10,000–12,000 ft. September 1906. Plant of 2–4 inches. Flowers pale yellow." G. Forrest. No. 5049.

"N.W. Yunnan, on trees and moss-covered boulders in dense, shady pine forests on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 9000–10,000 ft. September 1906. Succulent plant of 3–6 inches. Flowers and foliage greenish or ruddy yellow." G. Forrest. No. 2971.

"Yunnan, growing on damp cliffs and the roots of trees in valleys of the Mekong-Yangtse divide between Pung tze la and Yeh Chih. Alt. 9000–13,000 ft. September 1904." G. Forrest. No. 787 A B.

Sedum Alfredi, Hance.

"N.W. Yunnan, moist, shady situations on cliffs and boulders in side valleys on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 9000–11,000 ft. September 1906. Plant of 4–8 inches. Flowers greenish-yellow." G. Forrest. No. 2989.

"W. Yunnan, on moss-covered rocks and trunks of trees in mixed forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8000–10,000 ft. June–August 1906. Plant of 6–8 inches. Flowers greenish-yellow." G. Forrest. No. 4677.

Sedum bupleuroides, Wallich.

"N.W. Yunnan, dry, stony, open situations, ledges of cliffs, etc., on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 9000–10,500 ft. Plant of 9–12 inches. Flowers reddish brown, anthers green. June 1906." G. Forrest. No. 2441.

"N.W. Yunnan, open, grassy, situations in thickets on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 9000–10,000 ft. Plant of 14–16 inches. Flowers green." G. Forrest. No. 2492.

Sedum scabridum, Franchet.

"N.W. Yunnan, in crevices of boulders and on limestone drift on the eastern flank of the Lichiang Range. Lat. 27° 10′ N. Alt. 11,000–12,000 ft. June 1906. Tufted plant of 2–4 inches. Flowers red, anthers green." G. Forrest. No. 2377.

Sedum nobile, Franchet.

"W. Yunnan, mossy, stony, shady situations in pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 12,000–13,000 ft. October 1906. Plant of 3–9 inches. Flowers green, anthers brown." G. Forrest. No. 5055.

Sedum fastigiatum, Hook. f. et Thoms., var.

"W. Yunnan, on moss-covered boulders in shady situations on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9000–11,000 ft. September 1906. Tufted plant of 3–6 inches. Flowers greenish." G. Forrest. No. 5054.

Sedum roseum, Scop., var.

"N.W. Yunnan, on humus-covered boulders in the beds of mountain streams on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 11,000–12,000 ft. July 1906. Plant of 9–16 inches. Flowers greenish-brown." G. Forrest. No. 2610.

Sedum roseum, Scop., var.

"W. Yunnan, on moss-covered boulders in dry, shady situations in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10,000–11,000 ft. July–August 1906. Plant of 4–8 inches. Flowers greenish-yellow, root aromatic when fresh." G. Forrest. No. 5053.

Sedum roseum, Scop., var.

"N.W. Yunnan, moist, rocky pasture on the Kari pass, Yangtse-Mekong divide. Lat. 28° N. Alt. 12,000–14,000 ft. September 1904. Plant of 6–10 inches. Flowers green." G. Forrest. No. 5087.

"S.E. Tibet, moist, open pasture on the Mekong-Salwen divide, Mekong valley. Lat. 28° N. Alt. 12,000 ft. September 1904. Plant of 6–12 inches. Flowers green." G. Forrest. No. 5088.

LIST OF PLATES.

Illustrating M. Raymond Hamet's Paper on Species of Sedum collected by George Forrest in Yunnan and Eastern Tibet.

The plates are taken from photographs by Mr. R. Adam of dried specimens in the Herbarium of the Royal Botanic Garden, Edinburgh.

PLATE LXXXV. Sedum Balfouri, Raymond Hamet. Sp. nov.
LXXXVI. Sedum Forresti, Raymond Hamet. Sp. nov.

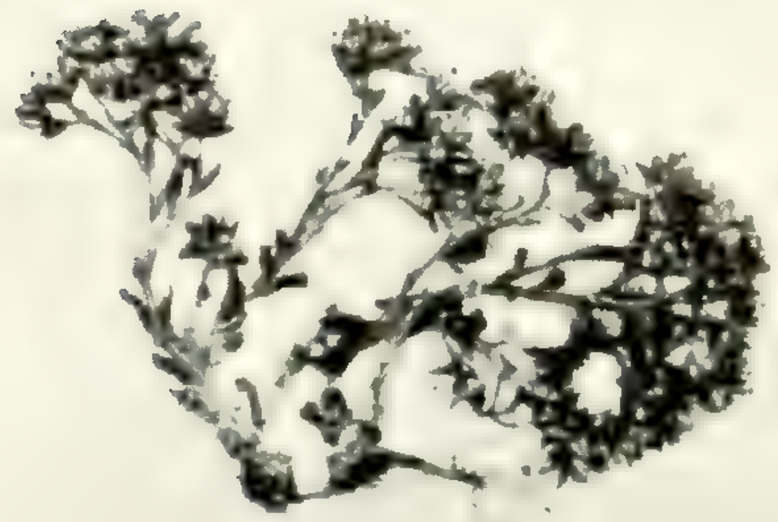
Bearbeitet für das „Pflanzenreich"

Sedum Balfouri Raymond Hamet
Original der Art!

det. 1911

PLANTS OF E. TIBET AND S.W. CHINA.
COLLECTED BY GEORGE FORREST
COLLECTED FOR A. K. BULLEY of NEBB, NESTON, CHESHIRE.

Sedum Balfouri, *Raymond Hamet.*



PLANTS OF E. TIBET AND S.W. CHINA.
2,808 COLLECTED BY GEORGE FORREST. 2,808.
[illegible] & A. [illegible]EY of NESS, NESTON, CHESHIRE

2808.

Plant of 2-3 inches. Flowers brassy yellow.
Dry, shady situations on cliffs and humus covered boulders on the eastern flank of the Lichiang Range.

Lat. 27°20'N. Alt. 10-11000 ft.
Aug. 1906. N.W.Yunnan, China.

Sedum Forresti Raymond Hamet
Original der Art!
det. Raymond Hamet 1941

Sedum Forresti, *Raymond Hamet.*

Plantae Chinenses Forrestianae.

Plants discovered and collected by George Forrest during his first exploration of Yunnan and Eastern Tibet in the years 1904, 1905, and 1906, and during his second exploration in the year 1910.

Enumeration and Description of Species of Saxifraga and Bergenia.

BY

PROFESSOR A. ENGLER AND E. IRMSCHER,

Berlin.

With Plates LXXXVII-CII.

SAXIFRAGA, Tourn.

SECT. **NEPHROPHYLLUM**, Gaud.

Fl. helv. iii, p. 85.

Saxifraga sibirica, L. Syst. x, p. 1027; Engl. Monogr. Saxifr. p. 101; Hooker f. Fl. Brit. Ind. ii, p. 390.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 13,000 ft. Alpine pasture. (Plant of 1½–2½ inches. Flowers white.)" G. Forrest. No. 6191. July 1910.

"W. Yunnan, eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–12,000 ft. Moist, shady rocks in side valleys. (Plant of 3–4 inches. Flowers white.)" G. Forrest. No. 4690.

SECT. **DACTYLOIDES**, Tausch.

Hort. Canal. fasc. i, pr. p.

Saxifraga humilis, Engl. et Irmscher. Sp. nov. Plate lxxxvii.

Densissime caespitosa, caudiculis epigaeis circ. 1 cm. longis dense rosulatim foliatis unifloris. Folia lineari- vel oblongo-lanceolata, 8–10 mm. longa, 2–3 mm. lata, margine pilis pluricellularibus uniserialibus laxe obsita, inferne hyalina, subtus nervis semipellucidis. Pedicelli brevissimi 3–5 mm. longi,

pilosi; sepala suberecta ovata, 2 mm. longa, 1·5 mm. lata, margine pilis longis uniserialibus glanduliferis laxe obsita, trinervia, nervis sub apice in verruculam majusculam oblongam confluentibus; petala obovata, haud unguiculata, 4 mm. longa, 2·5 mm. lata, trinervia, alba; stamina sepalis fere aequilonga; ovarium inferum subglobosum stilis erectis 1·5 mm. longis stigmate maiusculo instructis. Capsula . . .

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 35′ N. Alt. 15,000 ft. Moist situations amongst rocks. (Matted plant of 1 inch. Flowers white.)" G. Forrest. No. 6088. June 1910.

SECT. **BORAPHILA**, Engl.

Ind. crit. p. 9.

Saxifraga strigosa, Wall. Cat. No. 448.

"Yunnan, descent from pass between Teng Chuan and Sung Kwei valleys. Alt. 10,000 ft. Moist, rocky situations." G. Forrest. No. 171. September 1904.

"Near Sung Kusi. Alt. 12,000 ft." G. Forrest. No. 1139. November 1904.

"N.W. Yunnan, eastern flank of the Lichiang range. Lat. 27° 20′ N. Alt. 10–11,500 ft. Shady, moist situations in pine forests. (Plant of 6–10 inches. Petals white, basal portion spotted reddish-orange, anthers reddish-orange.)" G. Forrest. No. 2921. September 1906.

"Lat. 27° 30′ N. Alt. 9500–11,000 ft. Dry, open situations amongst pine scrub. (Plant of 2–6 inches, upper half of petals white, lower half spotted orange.)" G. Forrest. No. 6340. August 1910.

"W. Yunnan, eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–12,000 ft. Dry exposed situations on the margins of pine forests. (Plant of 3–6 inches. Petals yellowish-white, base of interior marked deep orange-red, anthers red.)" G. Forrest. No. 5061. September 1906.

"Eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. Dry, stony banks on the margin of pine forests. (Plant of 4–10 inches. Flowers creamy-yellow, spotted crimson-maroon at base.)" G. Forrest. No. 6872. 1910.

1789 **Saxifraga clavistaminea**, Engl. et Irmscher. Sp. nov. Plate lxxxviii.

Caudiculi epigaei erecti 1–4 cm. longi, plerumque inaequaliter foliati, foliis basi atque superne rosulatim confertis, medio saepe

aphylli, pluri (3–8)–flori, raro uniflori, longe pubescentes. Stolones ex foliorum axillis orientes ascendentes 3–6 cm. longi apice gemmulam foliorum minorum gerentes. Folia tenera, oblongo-obovata vel late spathulata, in petiolum brevem marginatum angustata, grosse saepe dupliciter crenato-dentata, dentibus subacutis aequalibus, subtus glabra, supra pilis brevibus multicellularibus pluriserialibus densiuscule obsita, basalia rosulatim conferta 1·5–2 cm. longa, 0·8–1 cm. lata, media (si adsunt) minora, superiora etiam conferta quam basalia maiora 2·5–3·5 cm. longa, 1·5–2 cm. lata. Inflorescentiae rami 4–7 cm. longi laxe pubescentes, 1–2–flori, unibracteati; pedicelli quam flores 2–3-plo longiores glabri; sepala in anthesi reflexa oblongo-ovata 2–2·5 mm. longa, 1–1·3 mm. lata, glaberrima, trinervia, nervis sub apice in verruculam confluentibus; petala ovata in unguem angustata 4·5 mm. longa, 2 mm. lata, trinervia, nervis lateralibus supra trientem inferiorem nervi medii abeuntibus, ad basim lutea, dimidio inferiore violaceo-maculata; stamina pistillum fere aequantia, filamentis clavatis, antheris atro-violaceis; ovarium ovoideum annulo mellifero crassiusculo, sensim in stilos breves stigmate minuto instructos attenuatum carpellis usque ad annulum separatis. Capsula . . .

"W. Yunnan, eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. Open, stony pastures. (Plant of 2–5 inches. Flowers white.)" G. Forrest. No. 6794. 1910.

Saxifraga micrantha, Edgew. Trans. Linn. Soc. xx, 1846, p. 50.

1234 1. **Micrantha typica.**

(*a*) f. **corymbiflora,** Engl. et Frmscher.

Caules floriferi multiflori, inflorescentia ramosissima corymbosa, ramis lateralibus longiusculis.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 11–12,000 ft. Crevices and ledges of moist, shady limestone cliffs. (Plant of 3–4 inches. Flowers white.)" G. Forrest. No. 6253. July 1910.

"W. Yunnan, eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 11–12,000 ft. Grassy openings in pine forests. (Plant of 4–8 inches. Flowers white, anthers brick-red.)" G. Forrest. No. 4204. September 1906.

(*b*) f. **minor,** Engl. et Frmscher.

Tenerrima, caules 7–14 cm. longi, pauci (2–4)–flori. Folia basalia late ovata obtusa, 10–13 mm. longa, 7–10 mm. lata.

"Eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. Dry, open, rocky situations. (Plant of 2–6 inches.

Petals white, anthers red, filaments petaloid.)" G. Forrest. No. 4198. September 1906.

(*c*) f. **foliosa,** Engl. et Frmscher.

Caules 4–25 cm. longi, pluri (2–8)–flori, fere medio uno folio ovato vel cordato-ovato 0·7–3 cm. longo, 0·4–1·5 mm. lato instructi; folia basalia ut typica.

"W. Yunnan, eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. Moist, shady ledges on cliffs in side valleys. (Plant of 2–4 inches. Flowers white, anthers red.)" G. Forrest. No. 4203. July 1906.

"Eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 12–13,000 ft. Barren alpine pasture. (Plant of 2–5 inches. Flowers white.)" G. Forrest. Nos. 6972, 7072. 1910.

2. var. **yunnanensis,** Franch.

"S.E. Tibet, on the Yangtze-Mekong divide. Lat. 28° N. Alt. 14–15,000 ft. In pine forests near the summit of the Kari. (Flowers white.)" G. Forrest. No. 99. September 1904.

S. micranthoides, Engl. Sp. nov. Plate lxxxix.

Caules 10–15 cm. longi, pluri (3–10)–flori; foliis caulinis destituti, modo ad inflorescentiae ramorum basim bracteati, tota longitudine ut pedunculi pilis pluricellularibus uniserialibus obsiti. Folia basalia oblongo-ovata vel elliptica, obtusa, aequaliter crenata vel crenato-dentata, non cordata, sed in petiolum laminae plerumque aequilongum raro longiorem sensim angustata; lamina 1·5–2 cm. longa, 0·7–1 cm. lata, supra pilis brevibus multicellularibus pluriserialibus densiuscule obsita; bracteae lanceolatae sessiles, saepe serratae, 5–10 mm. longae, 2–4 mm. latae. Pedicelli floribus multo longiores, ut caules pilosi; sepala in anthesi reflexa, ovata, 2–2·5 mm. longa, 1–1·5 mm. lata, glabra, trinervia, nervis sub apice in verruculam confluentibus; petala forma variabilia, plerumque late ovata in unguem brevem contracta, 3–4 mm. longa, 2–3 mm. lata, trinervia, alba, ad basin maculis duobus luteis instructa; stamina petalis fere aequilonga, filamentis late clavatis; ovarium ovoideum carpellis connatis in stilos breves crassiusculos stigmate parvo coronatos exeuntibus. Capsulae loculi oblongo-ovati; stili divaricati.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 11,000 ft. Moist, shady situations on rocks and ledges of cliffs. (Plant of 3–5 inches. Flowers white, anthers brick-red, filaments petaloid.)" G. Forrest. No. 2516. July 1906.

"Lat. 27° 25′ N. Alt. 11–12,000 ft. On humus-covered boulders and ledges of cliffs. (Plant of 2–5 inches. Flowers white.)" G. Forrest. No. 6206. July 1910.

Saxifraga atrata, Engl. Bull. Acad. Petersb. xxix (1883), p. 117.

"S.E. Tibet, on the Mekong-Salwen divide. Lat. 27° 28′ N. Alt. 11–13,000 ft. Dry, open, stony limestone ridges. (Erect plant of 2–4 inches. Flowers yellowish-white.)" G. Forrest. No. 467. July–August 1903.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 11–12,000 ft. Rocky, shady situations in pine forests. (Plant of 2–6 inches. Flowers white, base of petals marked rich lemon-yellow, anthers dark red.)" G. Forrest. No. 2928. September 1906.

"Lat. 27° 4′ N. Alt. 13–14,000 ft. Stony, alpine pasture, and on cliffs. (Plant of 2–3 inches. Petals pale yellow, with a blotch of deeper colour at base, gynaeceum dark green.)" G. Forrest. No. 6153. July 1910.

"Lat. 27° 20′ N. Alt. 12,000 ft. Limestone drift and crevices of cliffs. (Plant of 3–4 inches. Petals white, with an orange blotch at base, gynaeceum deep, ruddy green.)" G. Forrest. No. 6417. August 1910.

Saxifraga parvula, Engl. et Frmscher. Sp. nov. Plate xc.

Dense caespitosa, caudiculis brevibus rosulatim foliatis. Caules floriferi erecti 1·5–2 cm. longi, unibracteati, uniflori, tota longitudine atro-purpurei, pilis longis purpureis densiuscule obsiti. Folia basalia rosulatim conferta, subrotundo-obovata, in petiolum marginatum subaequilongum angustata, 9–11 mm. longa, 5–7 mm. lata, grosse crenata, subtus glabra, margine ac supra pilis longis multicellularibus pluriserialibus incoloratis laxe obsita. Pedicelli quam flores duplo longiores, dense longe violaceo-pilosi; flores in anthesi nutantes; sepala nec in anthesi nec in fructu reflexa, suberecta, petala paullum superantia, oblongo-ovata, 3·5–4·5 mm. longa, 2–3 mm. lata, superne margine sparse pilosa, trinervia, nervis anastomosibus conjunctis, sub apice in verruculam confluentibus, supra viridia, subtus dimidio inferiore vel omnino violacea; petala albida ovalia in unguem brevissimum angustata, 3·5 mm. longa, 2–2·5 mm. lata, trinervia, nervis lateralibus e medio nervi primarii orientibus, nervo primario apice clavato-dilatato; stamina pistillum fere aequantia, filamentis clavatis, antheris nigris; ovarium late ovoideum carpellis fere usque ad basim disjunctis, in stilos brevissimos stigmate majusculo coronatos exiens, inferne violaceum. Capsula loculis oblongo-ovatis divaricatis.

"Yunnan, eastern flank of the Lichiang Range. Lat. 27° 40′ N. Alt. 15–16,000 ft. On limestone drift and moist, rocky soil. (Plant of ½–1 inch. Flowers white.)" G. Forrest. No. 6158. July 1910.

SECT. **DIPTERA**, Borkh.

Roem. Mag. i, p. 29.

Saxifraga cortusaefolia, Sieb. et Zucc. Akad. Münch. iv, ii (1843), p. 190.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10–11,000 ft. On moss-covered rocks and banks in shady pine and mixed forests. (Plant of 6–15 inches. Flowers white, anthers brick-red.)" G. Forrest. No. 2401. June 1906.

"Lat. 27° 40′ N. Alt. 10–12,000 ft. Shady situations in and on the margins of mixed and pine forests. (Plant of 1–2 ft. Flowers white.)" G. Forrest. No. 6067. July 1910.

"W. Yunnan, eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 11–12,000 ft. Moist, shady, rocky situations in pine and mixed forests. (Plant of 9–14 inches. Flowers white, anthers brick-red.)" G. Forrest. Nos. 4199, 5059. August 1906.

"Eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. Shady banks in mixed forests. (Plant of 8–16 inches. Flowers creamy-white.)" G. Forrest. No. 6952. 1910.

SECT. **HIRCULUS**, Tausch.

Hort. Canal. i.

Conspectus gregum.

(A) Caules ad basim atque ad foliorum axillas pilis rufescentibus crispulis instructi.

(*a*) Caules aequaliter foliati; folia inferiora quam media non maiora, basalia deficientia.

(*a*) Folia oblongo-lanceolata vel oblongo-elliptica.

(i) Folia haud ultra 1·5 cm. longa. § *Densae.*
(ii) Folia circ. 3–4 cm. longa. § *Turfosae.*
(β) Folia cordato-ovata. § *Stellariifoliae.*
(*b*) Caules inaequaliter foliati; folia caulina a basi usque ad apicem sensim magnitudine decrescentia, basalia nunquam deficientia.
(*a*) Petala ovata vel obovata, vix triplo longiora quam lata. § *Hirculoideae.*
(β) Petala lineati-oblonga, triplo vel magis longiora quam lata. § *Lychnitideae.*

(B) Petioli foliorum basalium pilis rufescentibus parsissime instructi, inflorescentia pseudoracemosa, secunda floribus nutantibus. § *Nutantes.*

(C) Caules pilis rufescentibus crispulis destituti.
(*a*) Folia margine hyalino apicali haud instructa.
(*a*) Caules aequaliter foliati, gemmis instructi. § *Gemmiparae.*
(β) Caules inaequaliter foliati, foliis basalibus rosulatim confertis.
(i) Flagella deficientia.
(1) Folia maiora, margine cartilagineo spinuloso instructa. § *Cinerascentes.*
(2) Folia plerumque parva, margine cartilagineo spinuloso haud instructa. § *Sediformes.*
(ii) Flagella e rosula orientia. § *Flagellares.*
(*b*) Plantae parvae pulvinatae; folia antice margine hyalina fimbriata. § *Hemisphaericae.*

SUB-SECT. **DENSAE.**

Caules ad basim atque ad foliorum axillas pilis rufescentibus crispulis instructi, aequaliter foliati aut foliis inferioribus quam media minoribus. Folia basalia deficientia; caulina ovata vel oblongo-lanceolata, plerumque 6–10 mm., haud ultra 1·5 cm. longa.

Saxifraga Bulleyana, Engl. et Frmscher. Sp. nov. Plate xci.

Caudiculi hypogaei gemmiferi, caespitem densum formantes. Caules erecti, 1·5 dm. longi, densiuscule aequaliter foliati, uni- vel biflori, inferne rufescentes et parce, ad axillas foliorum dense longe fusco-pilosi, superne pilis pallidis pubescentes. Folia caulina conformia oblongo-ovata in petiolum brevem angustata, 0·8–1 cm. longa, 0·4–0·6 mm. lata, utrinque atque margine pilis brevissimis glanduligeris sparse obsita, inferiora quam media minora. Pedicelli breves floribus fere aequilongi, pilis longis glanduliferis non coloratis pubescentes; sepala in anthesi non reflexa, ovata acuta circ. 4 mm. longa, 2 mm. lata, subtus et margine dense nigro-glandulosa, tri-(raro quinque-) nervia, nervis sub apice plerumque in verruculam confluentibus, nervis lateralibus saepe bifidis; petala late ovata vel ovalia in unguem brevem abrupte contracta 6–7 mm. longa, 4–6 mm. lata, trinervia, nervis lateralibus bi- vel trifidis, ad basim juxta nervos laterales bicallosa, lutea; stamina pistillum primum paulum superantia; ovarium ovoideum in stilos crassiusculos ovarii fere dimidium aequantes primum erectos stigmate majusculo instructos exiens. Capsula . . .

"N.W. Yunnan, western flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 12–13,000 ft. Moist, stony alpine pasture. (Tufted plant of 5–6 inches. Flowers golden-yellow.)" G. Forrest. No. 6341 August 1910.

Saxifraga petrophila, Franch. Pl. Delav. (1890), p. 237, var. **litschiangensis,** Engl. et Frmscher. Var. nov. Plate xcii.

Maior quam typus, caulibus 1·2-1·4 dm. longis, inferne longe fusco-pilosis, superne dense glanduloso-nigro-pilosis, pluri-(4–6)-floris. Folia caulina subacuta, 5–7 mm. longa, 3–4 mm. lata, omnia lamina laxe, margine dense pilis nigris brevibus obsita.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 35′ N. Alt. 12,000 ft. Stony mountain meadows. (Plant of 3–6 inches. Flowers orange-yellow.)" G. Forrest. No. 6715. September 1910.

Saxifraga brachyphylla, Franch. Pl. Delav. (1890), p. 237.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 9–10,000 ft. Boggy situations. (Plant of 8–14 inches. Flowers orange-yellow.)" G. Forrest. No. 124. September 1904.

Saxifraga macrostigma (Franch. Pl. Delav. (1890), p. 240), emend. Engl. et Frmscher.

Conspectus varietatum et subvarietatum.

(A) Folia glabra, caules semper uniflori, petala ecallosa.
(1) *macrostigma typica* (Franch. *l.c.*).
(2) var. *gracillima*, Engl. et Frmscher.
(B) Folia glanduloso-pilosa, petala plerumque callosa.
(*a*) Caules uniflori.
(3) var. *Georgeana*, Engl. et Frmscher.
fa. *longipila*, Engl. et Frmscher.
(4) var. *aurantiascens*, Engl. et Frmscher.
(*b*) Caules pluriflori.
(5) var. *hypericoides* (Franch. pro specie), Engl. et Frmscher.
fa. *latifolia*, Engl. et Frmscher.
(*a*) subvar. *macrantha*, Engl. et Frmscher.
(*b*) subvar. *longistyla* (Franch. pro specie), Engl. et Frmscher. In collectione Forrestiana deest.

(1) **macrostigma typica** (Franch., *l.c.*).

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 13–14,000 ft. Stony alpine pasture. (Tufted plant of 2–4 inches. Flowers yellow.)" G. Forrest. No. 6592. September 1910.

"Lat. 27° 30′ N. Alt. 12–13,000 ft. Moist, stony alpine pasture. (Tufted plant of 3–6 inches. Flowers orange.)" G. Forrest. No. 6441 pr. p. August 1910.

"Lat. 27° 30′ N. Alt. 14–15,000 ft. Stony, moist pasture." G. Forrest. No. 6221 pr. p. July 1910.

"Lat. 27° 35′ N. Alt. 14,000 ft. Stony alpine pasture." G. Forrest. No. 6636 pr. p. September 1910.

(2) var. **gracillima,** Engl. et Frmscher. Var. nov.

Omnibus partibus minor quam typus. Caules 3–4 cm. longi densiuscule foliati. Folia saepe latiora, 5–6 mm. longa, 1–2 mm. lata.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. Ledges and crevices of limestone cliffs. (Tufted plant of 1–2½ inches. Flowers orange-yellow, stamens orange.)" G. Forrest. No. 2904. September 1906.

"Lat. 27° 30′ N. Alt. 12,000 ft. Limy pasture. (Plant of 1–2½ inches. Flowers deep orange.)" G. Forrest. No. 6137. July 1910.

"Lat. 27° 30′ N. Alt. 12–13,000 ft. Moist, stony alpine pasture." G. Forrest. No. 6441 pr. p. August 1910.

(3) var. **Georgeana,** Engl. et Frmscher. Var. nov.

Dense caespitosa. Caules conferte foliati inferne rufescentes, ad foliorum axillas laxe longe fusco-pilosi. Folia caulina *linearilanceolata margine pilis brevibus glanduliferis* laxe obsita. Pedicelli breviter glanduloso-pilosi, petala ovalia quam sepala *circ.* 1–1·5 *longiora,* 3·5–4 *mm. longa,* 1·5–2·5 mm. lata, ad basim juxta nervos laterales callosa.

"N.W. Yunnan, near the summit of the Kari pass between Pung-tzu-la and Shi-zu. Lat. 28° N. Alt. 15,000 ft. Heathy grassland." G. Forrest. No. 88. September 1904.

fa. **longipila,** Engl. et Frmscher.

Differt foliis margine longe fusco-pilosis, pedicellis gilvo-tomentosis.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 14–15,000 ft. Stony, moist pasture." G. Forrest. No. 6221 pr. p. July 1910.

(4) var. **aurantiascens,** Engl. et Frmscher. Var. nov.

Dense caespitosa. Caules inferne rufescentes et parce, ad foliorum axillas dense et longe fusco-pilosi. Folia caulina elliptica vel oblongo-elliptica, 10–11 mm. longa, 3–4 mm. lata pilis brevibus glanduliferis plus minusve dense obsita. Pedicelli breviter glanduloso-pilosi; petala quam sepala 3-plo longiora ovalia vel oblongo-ovata obtusa 7–8 mm. longa, 3–4 mm. lata, callosa.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10,500–11,000 ft. Dry, shady ledges of limestone cliffs. (Tufted plant of 3–4 inches. Flowers deep orange striped reddish-orange, anthers orange, filaments reddish. The whole plant when fresh has a smell similar to that of fresh rhubarb root.)" G. Forrest. No. 2947. September 1906.

"Lat. 27° 30′ N. Alt. 14–15,000 ft. Stony, moist pasture." G. Forrest. No. 6221 pr. p. July 1910.

"Lat. 27° 35′ N. Alt. 14,000 ft. Stony alpine pasture. (Tufted plant of 3–5 inches. Flowers deep orange striped longitudinally, red-orange.)" G. Forrest. No. 6636 pr. p. September 1910.

(5) var. **hypericoides** (Franch. Journ. de Bot. (1896), p. 261, pro specie), Engl. et Frmscher.

Caules plerumque 3-flori, inferne rufescentes, saepe fusco-lanuginosi, ad apicem usque conferte foliati. Folia caulina

breviter *lineari-lanceolata* 5-*plo longiora quam lata*, plus minusve glandulosa-pilosa. Petala oblongo-obtusa *circ.* 5–7 *mm. longa*, 2–2·5 *mm. lata.*

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 11–12,000 ft. Ledges and clefts of cliffs. (Plant of 2½–4 inches. Flowers orange.)" G. Forrest. No. 2576. July 1906.

"Lat. 27° 30′ N. Alt. 13,000 ft. Stony alpine pasture. (Plant of 4–6 inches. Flowers deep orange.)" G. Forrest. No. 6439. August 1910.

fa. **latifolia,** Engl. et Frmscher.

Differt foliis caulinis magis confertis lanceolato-ellipticis circ. 8–9. mm. longis, 3·5 mm. latis, 3-plo longioribus quam latis.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 11,000 ft. Ledges of cliffs and dry, rocky mountain pasture. (Tufted plant of 4–6 inches. Flowers deep orange.)" G. Forrest. No. 2863. September 1906.

(*a*) subvar. **macrantha,** Engl. et Frmscher.

Caules erecti 1·2–1·3 dm. longi, 2–3-flori. Folia caulina lanceolato-elliptica, circ. 11 mm. longa, 5 mm. lata. Petala oblongo-ovata 8 mm. longa, 4 mm. lata.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 11–12,000 ft. Forming clusters on ledges and in crevices of cliffs and boulders. (Plant of 4–9 inches. Flowers orange, anthers same colour.)" G. Forrest. No. 2757. August 1906.

SUB-SECT. **TURFOSAE.**

Caules ad basim atque ad foliorum axillas pilis rufescentibus crispulis instructi, aequaliter foliati aut foliis inferioribus quam media minoribus. Folia basalia deficientia; caulina lanceolata vel elliptica, sessilia, 3–4 cm. longa.

Saxifraga subamplexicaulis, Engl. et Frmscher. Sp. nov. Plate xciii.

Dense caespitosa; caulibus erectis 2–2·5 dm. longis aequaliter laxe foliatis, pauci-(1–3)-floris, tota longitudine pallidis glabris, summo apice dense breviter glanduloso-pilosis. Folia caulina conformia, sessilia, integra, lanceolato-ovata obtusa, cordato-subamplexicaulia, circ. 2·5–3 cm. longa, circ. 6 mm. lata, inferiora et media glabra vel margine infimo paullum et laxe longe fusco-pilosa, suprema et folia floralia margine pilis brevissimis glanduliferis densissime obsita. Pedicelli ex axillis summorum foliorum

orientes quam flores 2–3-plo longiores, dense breviterque nigro-glandulosi; sepala in anthesi horizontaliter patentia, in fructu reflexa, ovata acuta, 2·5–3 mm. longa, 1·5–2 mm. lata, subtus atque margine breviter glanduloso-pilosa, trinervia, nervo medio sub apice verruculam formante, nervis superne non confluentibus; petala oblongo-ovata in unguem brevem contracta, 6–6·5 mm. longa, 3 mm. lata, trinervia, ecallosa, aurantiaca; stamina pistillum fere aequantia; ovarium late ovoideum in stilos brevissimos stigmate parvo instructos exiens, loculis fere omnino connatis. Capsula . . .

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 10′ N. Alt. 11–12,000 ft. On humus-covered boulders in side valleys. (Tufted plant of 6–10 inches. Flowers orange, with anthers the same colour.)" G. Forrest. No. 2965. September 1906.

Saxifraga turfosa, Engl. et Irmscher. Sp. nov. Plate xciv.

Caules erecti 2·4–4 dm. longi densiuscule foliati, pluri-(3–12)-flori, inferne rufescentes glabri, superne pallidi pilis brevissimis glanduliferis dense obsiti, ad basim stolonibus 9–10 cm. longis laxe foliatis. Folia basalia atque caulina infera (si adsunt) lanceolata obtusa, in petiolum laminae aequilongum angustata, 2·5–3 cm. longa, circ. 8 mm. lata, glabra, caulina media et superiora suberecta, sessilia, oblongo-lanceolata, coriacea, media sensim in minora superiora transeuntia circ. 2–4 cm. longa, 0·8–1 cm. lata, glabra, superiora quam media angustiora 1·5–2 cm. longa, 3–4 mm. lata, margine et saepe supra brevibus pilis glanduliferis dense obsita. Flores hermaphroditi dichogami proterandri; pedicelli ad basim bracteolati quam flores 2–3-plo longiores, brevissime atque dense glanduloso-pilosi; sepala in anthesi reflexa, oblongo-ovata, 5 mm. longa, medio 2·5 mm. lata, pilis brevibus glandulosis multicellularibus margine saepe uniseriatis superne plerumque multiseriatis obsita, trinervia, nervis sub apice non confluentibus; petala ovalia vel oblongo-ovata brevissime unguiculata, circ. 10 mm. longa, 5 mm. lata, trinervia, nervis lateralibus saepe bifidis, ecallosa, aurantiaca; stamina pistillum primum superantia, deinde aequantia; ovarium ovoideum in stilos breves erectos stigmate parvo instructos exiens, loculis fere omnino connatis. Capsula oblongo-ovoidea stilis brevibus divaricatis.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 10′ N. Alt. 10,000 ft. Boggy, stony situations. (Plant of 7–14 inches. Flowers golden-yellow.)" G. Forrest. No. 123. September 1904.

"Lat. 27° 12′ N. Alt. 9–10,000 ft. Marshy mountain meadows.

(Plant of 14–18 inches. Flowers orange-yellow, anthers same.)" G. Forrest. No. 2988. September 1906.

"W. Yunnan, eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. Boggy mountain pastureland. (Plant of 12–18 inches. Flowers orange, anthers same.)" G. Forrest. No. 4206. October 1906.

"Eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9000 ft. Marshy pasture. (Plant of 10–18 inches. Flowers golden-yellow.)" G. Forrest. No. 6999. 1910.

Saxifraga Moorcroftiana, Wall. Cat. No. 453.

"N.W. Yunnan, western flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 12,000 ft. Moist situations amongst willow and rhododendron scrub. (Plant of 9–15 inches. Flowers golden-yellow.)" G. Forrest. No. 6367. August 1910.

SUB-SECT. STELLARIIFOLIAE.

Caules ad basim atque ad foliorum axillas pilis rufescentibus crispulis instructi, aequaliter foliati vel foliis inferioribus quam media minoribus. Folia basalia deficientia; caulina cordato-ovata, saepe petiolata.

Saxifraga cardiophylla, Franch. Nouv. Arch. Mus. Paris, ser. ii, viii (1886), p. 230.

"W. Yunnan, eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. Open mountain grassland. (Plant of 8–10 inches. Flowers orange-yellow, anthers same.)" G. Forrest. No. 5058. August–September 1906.

"Eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. Shady pasture on the margins of forests. (Plant of 12–16 inches. Flowers pale yellow.)" G. Forrest. No. 6942. 1910.

SUB-SECT. HIRCULOIDEAE.

Caules ad basim atque ad foliorum axillas pilis rufescentibus crispulis instructi, inaequaliter foliati, foliis basalibus longe petiolatis quam caulina saepe maioribus. Folia caulina a basi usque ad caulis apicem magnitudine sensim decrescentia.

Saxifraga nigroglandulosa, Engl. et Frmscher. Sp. nov. Plate xcv.

Laxe caespitosa, surculis prostratis deficientibus. Caules breves 0·5–1·5 dm. longi, laxe foliati, plerumque uniflori, raro

biflori, inferne rufescentes et parce, ad foliorum axillas dense longe fusco-pilosi, superne pilis longis glanduligeris nigris dense obsiti. Folia basalia atque caulina infera 3–2 cm. longe petiolata, lamina spathulata vel lanceolata 1–2 cm. longa, 6–4 mm. lata, supra sparse pilosa; folia caulina superiora sessilia lanceolata obtusa. Flores majusculi, hermaphroditi dichogami proterandri, laterales (si adsunt) longius pedicellati; sepala in anthesi non reflexa, ovata obtusa 4·5–5·5 mm. longa, inferne dense et margine hyalino sparse pilis longis glanduliferis nigris obsita, 5–nervia, nervis sub apice in verruculam confluentibus; petala obovata subaurantiaca quam sepala 1·5–plo longiora, 8–10·5 mm. longa, circ. 4·5 mm. lata, 5–nervia, supra multis callis minutis disperse obtecta; stamina pistillum primum superantia; ovarium late ovoideum in stilos breves stigmate parvo instructos exiens. Capsula. . . .

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. Limestone cliffs and humus-covered boulders. (Tufted plant of 2–4 inches. Flowers orange-yellow.)" G. Forrest. Nos. 2910, 2910A. September 1906.

"Lat. 27° 30′ N. Alt. 14–15,000 ft. Moist, stony pasture. (Plant of 1–3 inches. Flowers golden-yellow.)" G. Forrest. No. 6222. July 1910.

"Lat. 27° 35′ N. Alt. 14,000 ft. Moist, peaty, alpine pasture. (Matted plant of 2–4 inches. Flowers golden-yellow.)" G. Forrest. No. 6359. August 1910.

"Lat. 27° 20′ N. Alt. 15,000 ft. Stony, alpine pasture. (Plant of 4–6 inches. Flowers deep golden-yellow)." G. Forrest. No. 6376. August 1910.

Nota.—Haec planta habitu *Saxifragae chumbiensi*, Engl. et Frmscher valde similis, attamen ab illa differt foliis caulinis magis approximatis et paullum latioribus, caule superne nigro-glanduloso, sepalis nigro-glandulosis, petalis multi-callosis. Haec et illa *Saxifragae Hirculo* valde affines, ut etiam ei sub titulo subspecierum adjungi possint.

Saxifraga tsangchanensis, Franch. Pl. Delav. (1878), p. 233.

"W. Yunnan, eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 11–12,000 ft. Open, dry situations on ledges of cliffs in side valleys. (Tufted plant of $1\frac{1}{2}$–2 inches. Petals orange, anthers yellow.)" G. Forrest. No. 4200. September 1906.

"Lat. 25° 40′ N. Alt. 11,000 ft. Exposed, grassy slopes. (Plant of 3–6 inches. Flowers orange, anthers the same.)" G. Forrest. No. 4211. September–October 1906.

"Lat. 25° 40′ N. Alt. 12,000 ft. Moist, stony pastures.

(Plant of 2–4 inches. Flowers golden-yellow.)" G. Forrest. No. 6943. 1910.

Saxifraga Forrestii, Engl. et Frmscher. Sp. nov. Plate xcvi.

Dense caespitosa, caulibus brevibus 0·5–1 dm. longis, laxe foliatis, plerumque pluri- (2-4)-floris, raro unifloris, glabris, inferne rufescentibus, ad foliorum axillas saepissime fusco-pilosis. Folia basalia copiosa, in caulina haud transeuntia, 1–1·5 cm. longa, in petiolum quam laminae circ. duplo longiorem angustata, lamina spathulata vel lanceolata circ. 3–6 mm. longa, 1·5–2 mm. lata, supra rufescenti-pilosa, caulina sessilia lanceolata obtusa, saepe supra fusco-pilosa. Pedicelli interdum pilis brevibus glanduligeris nigris dense obtecti, floribus circ. 3–4–plo longiores; sepala anthesi reflexa, oblonga obtusa, 3 mm. longa, margine pilis minutis multicellularibus uniserialibus laxe obsita, parallele trinervia; petala aurantiaca oblongo-elliptica, trinervia, in unguem contracta, circ. 6 mm. longa, 2–2·5 mm. lata, ecallosa; stamina pistillum fere aequantia, ovarium ovoideum in stilos breves stigmate parvo coronatos exiens. Capsula oblongo-ovata.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 10,000 ft. On banks and humus-covered boulders. (Plant of 2–4 inches. Flowers bright yellow.)" G. Forrest. No. 6575. September 1910.

"Lat. 27° 30′ N. Alt. 10–11,000 ft. On rocks and dry, shady banks. (Plant of 3–5 inches. Flowers orange-yellow.)" G. Forrest. No. 6716. September 1910.

Nota.—Haec planta valde affinis *Saxifragis tsangchanensi* et *subspathulatae,* ab illa differt sepalis parallele trinerviis, anthesi reflexis, ab hac petalis unguiculatis atque foliis basalibus rufescenti-pilosis.

Saxifraga diversifolia, Wall.

Dispositio varietatum atque formarum.

(A) Sepala nervis in verruculam non confluentibus, plerumque parallelis.

(1) *diversifolia typica.*

(*a*) fa. *foliata,* Engl. et Frmscher.

(*b*) fa. *haematophylla* (Franch. pro var.).

In collectione Forrestiana deest.

(*c*) fa. *parviflora* (Franch. pro var.).

In collectione Forrestiana deest.

(*d*) fa. *alpina,* Engl. et Frmscher.

(*e*) fa. *angustibracteata,* Engl. et Frmscher.

(2) var. *Souliana*, Engl. et Frmscher.
In collectione Forrestiana deest.

(B) Sepala nervis in verruculam confluentibus.

(3) var. *parnassifolia*, Don.
In collectione Forrestiana deest.

(1) **diversifolia typica.**

2328 (*a*) fa. **foliata,** Engl. et Frmscher.

Caules erecti 1·4–5 dm. longi uni- vel plurifoliati, pluri-(3–20)-flori. Folia margine *glabra* vel *brevissime* dense *glanduloso-pilosa*, basalia atque caulina infera longe petiolata lamina subcordato-ovata subacuta vel cordata, in caulina media transeuntia, media breviter petiolata, saepe sessilia, oblongo-ovata obtusa vel late ovata subacuta, 2–5 cm. longa, 1–4 cm. lata. Petala circ. 7 mm. longa.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 11–12,000 ft. Moist, shady situations on mountain pastureland. (Plant of 6–15 inches. Flowers bright orange.)" G. Forrest. No. 2864. September 1906.

"Lat. 27° 20′ N. Alt. 12,000 ft. Moist cliffs and rocks. (Plant of 6–12 inches. Flowers golden-yellow.)" G. Forrest. No. 6342. August 1910.

"Lat. 27° 30′ N. Alt. 13,000 ft. Cane brakes and rhododendron forests. (Plant of 12–16 inches. Flowers golden-yellow.)" G. Forrest. No. 6651. September 1910.

"W. Yunnan, on the western slopes of the Tali Range, near the head of the Yang-pi valley. Lat. 25° 40′ N. Alt. 9–12,000 ft. Grassy, shady situations. (Plant of 1–2 ft. Flowers orange-yellow.)" G. Forrest. No. 983. September 1905.

2329 (*d*) fa. **alpina,** Engl. et Frmscher.

Dense caespitosa. Caules erecti 1–2 dm. longi, densiuscule foliati, uni-vel pluri-(3)-flori. Folia margine pilis longis fuscis dense, lamina laxe obsita, basalia et caulina inferiora longe petiolata, lamina cordato-ovata subacuta 2–2·5 cm. longa, 1·5–2 cm. lata in media transeuntia, media et superiora ovata subacuta, plus minusve breviter petiolata vel sessilia. Petala circ. 1 cm. longa.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 13–14,000 ft. Stony, alpine pasture. (Plant of 3–7 inches. Flowers golden-yellow.)" G. Forrest. Nos. 6358, 6506, 6615, 6666. August 1910.

"Lat. 27° 30′ N. Alt. 14–15,000 ft. Stony, alpine pasture. (Plant of 3–5 inches. Flowers deep orange-yellow.)" G. Forrest. No. 6375. August 1910.

(*e*) fa. **angustibracteata,** Engl. et Frmscher.

Caules erecti 1·2–2·4 dm. longi laxe foliati, pluri-(3–30)-flori. Foliorum petioli subglabri; folia basalia et caulina infera longe petiolata cordato-ovata obtusa, lamina 2–4 cm. longa, 2–3·5 cm. lata, plerumque in caulina media *non* transeuntia; media et superiora sessilia, lamina ovata lanceolata 1–1·5 cm. longa, 0·3–0·5 cm. lata. Flores quam aliarum formarum minores, petala circ. 3–6 mm. longa.

"N.W. Yunnan, on the ascent of the Nin Chang pass from Ke-Ho-wan on the Yangtze to the Chung-Tien plateau. Lat. 27°40′N. Alt. 11–13,000 ft. Moist, rocky situations. (Plant of 6–12 inches. Flowers golden-yellow.)" G. Forrest. No. 115. September 1904.

"W. Yunnan, on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–11,000 ft. Moist, shady situations in pine forests. (Plant of 6–12 inches. Flowers orange, anthers same shade.)" G. Forrest. Nos. 4207, 5056. August–September 1906.

"Lat. 25° 40′ N. Alt. 10,000 ft. Moist, shady situations on the margins of pine forests. (Plant of 10–15 inches. Flowers yellow.)" G. Forrest. No. 6843. 1910.

"Lat. 25° 40′ N. Alt. 11,000 ft. On rocks in moist, shady pine forests. (Plant of 6–10 inches. Flowers orange.)" G. Forrest. No. 7234. 1910.

SUB-SECT. **NUTANTES.**

Caules inferne glabri. Petioli foliorum basalium pilis rufescentibus crispulis sparsissime instructi. Inflorescentia pseudo-racemosa, secunda; flores nutantes.

Saxifraga nutans, Hook. f. et Thoms. Journ. Linn. Soc. ii (1857), p. 69.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. Grassy, stony slopes at the base of limestone cliffs. (Plant of 6–12 inches. Flowers pale canary-yellow.)" G. Forrest. No. 2621. July 1906.

"Lat. 27° 30′ N. Alt. 12,000 ft. Open, stony pasture. (Plant of 6–12 inches. Flowers bright yellow.)" G. Forrest. No. 6599. August 1910.

SUB-SECT. GEMMIPARAE.

Caules parte inferiore pilis plerumque incoloratis saepe glanduliferis hispidis obsiti, raro glabri (*S. brachypoda*), aequaliter foliati (excl. formis *S. gemmiparae*), ad foliorum axillas vel ad basim gemmis instructi. Foliorum lamina discolor, subtus albescens, rigida, margine spinulosa.

Saxifraga hispidula, Don. Trans. Linn. Soc. xiii (1822), p. 380,
var. **Doniana,** Engl. Monogr. Saxifr., p. 222.

"Yunnan, ascent of the Ninchang pass from Ke-Ho-wan on the Yangtse. Alt. 11–12,000 ft. Dry, rocky situations." G. Forrest. No. 114. September 1904.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 11–12,000 ft. Moss-covered rocks and grassy slopes. (Plant of 3–6 inches. Flowers orange-yellow.)" G. Forrest. No. 2696. August 1906.

"Lat. 27° 30′ N. Alt. 10–11,000 ft. On rocks in shady situations. (Tufted plant of 2–5 inches. Flowers deep orange.)" G. Forrest. No. 6440. August 1910.

"W. Yunnan, eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. Ledges and crevices of cliffs in side valleys. (Tufted plant of 3–6 inches. Flowers orange, anthers same shade.)" G. Forrest. Nos. 4208, 5062. September 1906.

"Lat. 25° 40′ N. Alt. 9–10,000 ft. Dry stony pasture and on boulders. (Tufted plant of 3–6 inches. Flowers orange.)" G. Forrest. No. 7073. 1910.

Saxifraga brachypoda, Don. Trans. Linn. Soc. xiii (1822), p. 378.

"W. Yunnan, eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 11–12,000 ft. Dry shady situations on ledges of cliffs in side valleys. (Tufted plant of 1–3 inches. Flowers yellow, anthers deep red.)" G. Forrest. No. 4201. October 1906.

"Lat. 25° 40′ N. Alt. 10–11,000 ft. Dry banks in shady pine forests. (Plant of 2–4 inches. Flowers golden-yellow.)" G. Forrest. No. 6941. 1910.

var. **fimbriata** (Wall.), Engl. et Frmscher.

"N.W. Yunnan, open heathy situations on the summit of the Kari pass between Pung-tzu-la and the Shu-pa valley." G. Forrest. No. 89. September 1904.

"Eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 11–12,000 ft. Dry ledges of cliffs and on humus-covered boulders.

(Plant of 6–9 inches. Flowers yellow, anthers same colour.)" G. Forrest. No. 2867. September 1906.

"Lat. 27° 25′ N. Alt. 10–11,000 ft. Stony grassland on the margins of mixed forests. (Plant of 4–9 inches. Flowers golden-yellow.)" G. Forrest. No. 6627. August 1910.

Saxifraga gemmipara, Franch. Journ. de Bot. (1896), p. 262.

"Yunnan, mountains of the Mekong and Yangtse basins. Alt. 10–14,000 ft. Common on rocky situations." G. Forrest. Nos. 104, 113. September 1904.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 10′–27° 25′ N. Alt. 9–10,000 ft. Dry, open, rocky situations. (Procumbent plant of 4–8 inches. Flowers white, anthers orange.)" G. Forrest. No. 2926. September 1906.

"W. Yunnan, eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. Open, dry, rocky pastureland. (Plant of 6–12 inches. Flowers white, base of petals yellowish.)" G. Forrest. Nos. 4210, 5060. July–August 1906.

"Lat. 25° 40′ N. Alt. 8000 ft. Dry, stony pasture and on ledges of cliffs. (Plant of 4–6 inches. Flowers creamy-white.)" G. Forrest. No. 6995. 1910.

Saxifraga Balfourii, Engl. et Prmscher. Sp. nov. Plate xcvii.

Caudiculi hypogaei gemmiferi, caespitem densum formantes. Caules erecti saepe ramosi 1·0–1·6 dm. longi, ramis plerumque pluri-(2–4)-floris, densiuscule foliati, inferne fusco-pubescentes et gemmiferi, superne dense glanduloso-pilosi. Gemmarum cataphylla linearia, albomarginata, ciliata. Folia caulina sessilia, pilis glanduligeris brevibus haud coloratis utrinque densiuscule obsita, subtus albescentia, inferiora quam media minora, sub-orbicularia vel late elliptica, media elongato-elliptica, utrinque acuta, 14–16 mm. longa, 5–9 mm. lata, multinervia, nervis supra prominulis, apice in aristam persistentem primum glandula coronatam desinentia. Pedicelli supra basin bracteolati, quam flores duplo longiores, dense breviterque nigro-glandulosi; sepala oblongo-ovata, acuta, circ. 3–3·5 mm. longa, 1·5 mm. lata, subtus et margine dense nigro-glandulosa, trinervia, nervis sub apice confluentibus, in anthesi horizontaliter patentia; petala obovata vel obovato-oblonga breviter unguiculata, 5–7 mm. longa, 3–3·5 mm. lata, trinervia, ecallosa lutea; stamina pistillum paullum superantia; ovarium oblongum stilis gracilibus ovario aequilongis primum erectis, demum saepe divaricatis instructum, loculis fere usque ad basim disjunctis. Capsula oblonga, stilis divaricatis.

"Yunnan, on the descent from pass between Teng Chuan and Sung Kwei valleys. Alt. 10–11,000 ft. Moist rocky situations." G. Forrest. No. 74. September 1902.

"Near Sung Kusi. Alt. 12,000 ft." G. Forrest. No. 1140. September 1904.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. Crevices of cliffs and boulders. (Plant of 3–10 inches. Flowers orange-yellow, anthers red.)" G. Forrest. No. 2756. August 1906.

"Lat. 27° 35′ N. Alt. 13,000 ft. Stony, alpine pasture. (Tufted plant of 6–10 inches. Flowers orange.)" G. Forrest. No. 6650. September 1910.

Saxifraga filicaulis, Wall. Cat. No. 445.

"Yunnan, near Sung Kusi. Alt. 12,000 ft." G. Forrest. No. 1141. September 1904.

"Ascent of the Nin Chang pass to Chung Tien plateau, also abundant in places on plateau. Alt. 10–14,000 ft. Rocky situations." G. Forrest. No. 170. September 1904.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 9–12,000 ft. Dry ledges and crevices of cliffs. (Procumbent plant of 6–9 inches. Flowers golden-yellow.)" G. Forrest. No. 2749. July 1906.

"Lat. 27° 30′ N. Alt. 9–11,000 ft. On cliffs, boulders, and dry, stony pasture. (Plant of 4–10 inches. Flowers yellow.)" G. Forrest. No. 6515. September 1910.

"W. Yunnan, eastern flank of the Tali Range. Lat. 27° 40′ N. Alt. 11–12,000 ft. Dry, exposed rocky situations. (Tufted plant of 3–10 inches. Flowers orange, anthers same.)" G. Forrest. No. 4209. September 1906.

"Eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–11,000 ft. Dry banks in pine forests. (Matted plant of 3–10 inches. Flowers orange-yellow.)" G. Forrest. No. 6871. 1910.

SUB-SECT. CINERASCENTES.

Caules pilorum rufescentium crispulorum destituti, inaequaliter foliati, foliis basalibus rosulatim confertis, rigidis, margine cartilaginea spinulosa atque aristata ; caules floriferi oligophylli.

Saxifraga cinerascens, Engl. et Frmscher. Sp. nov. Plate xcviii.

Dense caespitosa, caudiculis epigaeis rosulatim foliatis. Caules floriferi oligophylli, uni-triflori, inferne, saepe tota longi-

tudine rufescentes, pilis nigro-glandulosis aequaliter obsiti. Folia caudicularum in caulina minora non transeuntia, rigidula, lineari-lanceolata, 7–10 mm. longa, 1·5–2·5 mm. lata, margine cartilagineo laxe ciliata vel ciliato-spinulosa, apice in aristam persistentem excurrentia, subtus albescentia nitida, caulina lanceolata, 4–6 mm. longa, 1·5–2 mm. lata, rigidula, margine *pilis brevibus nigro-glandulosis dense obsita*, aristata. Pedicelli nigro-glandulosi, quam flores 1–2–plo longiores. Flores hermaphroditi dichogami proterandri; sepala in anthesi non reflexa, oblongo-ovata subacuta, 3 mm. longa, 1–1·5 mm. lata, superne margine et subtus pilis brevissimis nigro-glandulosis obsita, apice hyalino trinervia, nervis sub apice non confluentibus; petala obovata, 5·5–6·5 mm. longa, 3 mm. lata, in petiolum angustata, trinervia, nervis lateralibus bifidis, juxta laterales ad basim callosa, lutea. Stamina primum pistillum superantia, deinde aequantia; ovarium oblongo-ovoideum, in stilos dimidium ovarii aequantes vel paullum longiores saepe divaricatos exiens. Capsula . . .

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 10–11,500 ft. On humus-covered boulders and dry ledges of cliffs. (Plant of 2–4 inches. Flowers golden yellow, anthers the same shade.)" G. Forrest. Nos. 2034, 3034. September 1906.

2039 fa. **major,** Engl. et Frmscher.

Folia caudicularum 13–20 mm. longa, 3–5 mm. lata, caulina 7–10 mm. longa, 2 mm. lata.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 12,000 ft. On rocks and boulders." G. Forrest. No. 6628 pro parte. September 1910.

SUB-SECT. **SEDIFORMES.**

Caules parvi 6–8 cm. longi, glabri vel dense glanduloso-pilosi, pilis rufescentibus crispulis destituti, inaequaliter foliati, foliis basalibus semper rosulatim confertis. Folia raro ultra 1 cm. longa spathulata vel ovato-oblonga integra, rarissime ad apicem versus grosse dentata, non cartilagineo-marginata neque -aristata.

Saxifraga signata, Engl. et Frmscher. Sp. nov. Plate xcix.

Caules erecti 0·8–1·8 dm. longi laxe aequaliter foliati, pluri-(5–17)-flori, tota longitudine atroviolacei densissime pilis brevibus glandulosis violaceis obsiti. Folia basalia spathulata rosulatim dense conferta 1–1·5 cm. longe petiolata, lamina orbiculari-ovata vel rhomboidea 3–5 mm. longa, 2–4 mm. lata, margine pilis

brevibus setosis dense obsita, caulina oblongo-spathulata 10–15 mm. longa, 3–4 mm. lata, supra atque margine pilis violaceo-glandulosis instructa. Flores majusculi hermaphroditi dichogami proterandri; inflorescentiae racemosae rami laterales angulo 60°–80° patentes 6–7 cm. longi plerumque bibracteolati, biflori, atroviolacei, ut pedicelli pilis brevibus violaceo-glandulosis densissime obsiti; sepala in anthesi reflexa, lineari-lanceolata, obtusa, 7–9 mm. longa, 2–3 mm. lata, margine et laminae parte superiore breviter glanduloso-pilosa, trinervia, nervis sub apice confluentibus, lateralibus bifidis; petalaoblongo-ovata, in unguem abrupte angustata, circ. 8 mm. longa, 3–4 mm. lata, trinervia, basi juxta nervos laterales ecallosa, aurantiaca, margine inferiore dimidio purpureo-punctulata; stamina pistillum primum superantia; ovarium late ovoideum in stilos brevissimos conniventes vel erectos stigmate parvo instructos exiens, atro-viride. Capsulae ovoideae stili breves divaricati.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. Open situations on limestone drift at the base of cliffs. (Plant of 4–8 inches. All parts, excepting the corolla darkly glandular, petals pale yellow, with the basal half on interior spotted deep maroon, anthers yellow, gynaecium dark green.)" G. Forrest. No. 2958. September 1906.

"Lat. 27° 30′ N. Alt. 11–13,000 ft. On limestone drift. (Plant of 4–9 inches. Flowers yellow, lower half of petals striped and marked deep maroon, gynaeceum deep maroon.)" G. Forrest. No. 6574. September 1910.

Saxifraga candelabrum, Franch. Pl. Delav. (1890), p. 232.

"Yunnan, on pass between Chung Tien and Tang Tin. Alt. 11–12,000 ft. Rocky banks in pine woods." G. Forrest. No. 50. September 1904.

"Mekong-Salwen divide behind Tzekou Mission." G. Forrest. No. 173. 1904.

Saxifraga sediformis, Engl. et Frmscher. Sp. nov. Plate c.

Dense caespitosa. Caules 4–8 cm. longi, densiuscule aequaliter foliati, pluri-(2–9)-flori, inferne rufescentes, tota longitudine pilis longis glanduliferis subviolaceis obsiti. Folia inferiora confertim rosulata, spathulata, 5–8 mm. longa, 1·5–3 mm. lata, margine dense, supra sparse pilis glanduliferis non coloratis obsita, caulina conformia lanceolato-ovata vel obovata subacuta ad basim sensim angustata, 5–9 mm. longa, 1·5–5 mm. lata, margine atque supra dense fusco-glanduloso-pilosa. Inflorescentiae rami laterales 1–2 cm. longi, bi-tribracteati, 1–3–flori,

ut pedicelli pilis longis fusco-glandulosis dense obsiti; sepala in anthesi reflexa, ovata acuta, 3–3·4 mm. longa, 1·5 mm. lata, subtus atque margine glanduloso-pilosa, trinervia, nervis sub apice in verruculam oblongam confluentibus; petala oblongo-ovata in unguem abrupte angustata, 5–6·5 mm. longa, 2–2·5 mm. lata, trinervia, basi juxta nervos laterales callosa, lutea; stamina pistillum fere aequantia; ovarium oblongo-ovoideum in stilos dimidium ovarii aequantes stigmate parvo instructos exiens. Capsula ovoidea stilis divaricatis coronata.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 12–13,000 ft. Open situations on cliffs and humus-covered boulders. (Tufted plant of 2–3 inches. Flowers yellow, anthers dark, ruddy green.)" G. Forrest. No. 2912. September 1906.

"Lat. 27° 20′ N. Alt. 12–13,000 ft. On cliffs and rocks. (Tufted plant of 2–4 inches. Flowers golden yellow.)" G. Forrest. No. 6355. August 1910.

Saxifraga drabaeformis, Franch. Pl. Delav. (1890), p. 235.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. Crevices of limestone rocks and cliffs. (Plant of 1–2½ inches. Flowers deep, rich yellow.)" G. Forrest. No. 2956. September 1906.

"Lat. 27° 20′ N. Alt. 12–13,000 ft. Clefts and ledges of cliffs. (Tufted plant of 3–4 inches. Flowers bright golden yellow, anthers same shade.)" G. Forrest. No. 3025. September 1906.

"Lat. 27° 35′ N. Alt. 13–14,000 ft. On limestone drift. (Plant of 3–6 inches. Flowers bright orange.)" G. Forrest. No. 6681. September 1910.

2139 **Saxifraga chrysanthoides,** Engl. et Frmscher. Nom. nov.

(=*S. chrysantha,* Franch., non Asa Gray.)

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. Forming compact masses on humus-covered boulders in beds of mountain streams. (Plant of 1–2 inches. Flowers bright orange, anthers same shade.)" G. Forrest. No. 2786. August 1906.

"Lat. 27° 25′ N. Alt. 12–14,000 ft. On moist cliffs and boulders. (Plant of 1–1½ inches. Flowers bright yellow.)" G. Forrest. No. 5998. July 1910.

"Lat. 27° 30′ N. Alt. 15,000 ft. Moist, open, stony situations amongst rocks. (Tufted plant of 1 inch. Flowers bright golden yellow.)" G. Forrest. No. 6251. July 1910.

SUB-SECT. **FLAGELLARES.**

Caules flagellis e rosula orientibus, pilorum rufescentium crispulorum destituti. Folia saepe rigidula spinulosa.

Saxifraga Brunoniana, Wall. Cat. No. 444.

var. **majuscula,** Engl. et Frmscher. Var. nov. Plate ci.

Maïor quam typus. Caules 8–16 cm. longi, pluri-(3–9)-flori. Folia basalia 1·5–2 cm. longa, 3–5 mm. lata. Inflorescentia composita, ramis 4–10 cm. longis.

"W. Yunnan, eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. On boulders in dry, shady situations in side valleys. (Plant of 2–6 inches. Flowers bright yellow, anthers red.)" G. Forrest. No. 4202. October 1906.

"Lat. 25° 40′ N. Alt. 10,000 ft. Dry situations on humus-covered boulders and ledges of cliffs. (Plant of 4–8 inches. Flowers golden yellow.)" G. Forrest. No. 7084. 1910.

"Lat. 25° 40′ N. Alt. 8–9000 ft. Dry, stony pasture. (Plant of 4–6 inches. Flowers golden yellow.)" G. Forrest. No. 7236. 1910.

SECT. **KABSCHIA,** Engl.

Linn. xxxv atque ind. crit., p. 4 em.

Saxifraga pulchra, Engl. et Frmscher. Sp. nov. Plate cii.

Dense caespitosa, caudiculis subfruticulosis 1–2 cm. longis foliis dense imbricatis obtectis. Caules floriferi oligophylli 3–5 cm. longi, pilis nigro-glandulosis incoloratis obsiti, pluri-(4–7)-flori. Caudiculorum folia apice reflexa, coriacea, spathulato-lingulata subacuta, 6 mm. longa, 2–2·5 mm. lata, subtus carinata, integra, glabra, basi tantum margine breviter ciliata, antice juxta marginem serie 5–9 (plerumque 7) foveolarum squama calcarea obtectarum instructa; caulina spathulata 5–7 mm. longa, 1–2 mm. lata, dimidio inferiore dense glanduloso-pilosa, supra plurifoveolata. Pedicelli quam flores duplo longiores, dense glanduloso-pilosi; sepala in anthesi et fructu suberecta, ovata obtusa, 3 mm. longa, medio 1·5 mm. lata, margine plerumque glabra, subtus ad basin glanduloso-pilosa, trinervia, nervis sub apice *non* confluentibus, atropurpurea; petala obovato-oblonga, ad basin sensim in unguem angustata 7–8 mm. longa, 3 mm. lata, trinervia ecallosa, purpurea; stamina petalis fere aequilonga, filamenta et antherae purpureae; ovarium late

globoso-ovoideum in stilos longissimos (5 mm.) divaricatos stigmate parvo instructos abrupte attenuatum, purpureum. Capsulae loculi late ovoidei, stili divaricati.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 10–11,000 ft. Forming dense, cushion-like masses in clefts of inaccessible limestone cliffs. (Plant of 2–4 inches. Flowers pink.)" G. Forrest. No. 2168. May 1906.

"Lat. 27° 20′ N. Alt. 11–12,000 ft. Forming dense, matted cushions 6–12 inches diameter in the crevices of limestone cliffs. (Plant of 2–4 inches. Flowers rose-pink.)" G. Forrest. No. 5966. June 1910.

Saxifraga chionophila, Franch. Journ. de Bot. 1890, p. 265.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 15–16,000 ft. Open situations on limestone drift. (Plant of 1–1½ inches. Flowers olive green, anthers yellow.)" G. Forrest. No. 5904. June 1910.

"Lat. 27° 20′ N. Alt. 11,000 ft. Dry limestone cliffs. (Plant of 1–2 inches. Flowers minute, yellow.)" G. Forrest. No. 5778. June 1910.

"Western flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. On cliffs and boulders. (Plant of 1–1½ inches. Flowers greenish-maroon.)" G. Forrest. No. 5037. June 1910.

Saxifraga likiangensis, Franch. Journ. de Bot. (1890), p. 266.

"N.W. Yunnan, eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11,000 ft. In a crevice of a limestone boulder. (Tufted plant of 1 inch. Flowers white.)" G. Forrest. No. 6091. July 1910.

BERGENIA, Moench.

Bergenia purpurascens (Hook. f. et Thoms.) Engl. in Nat. Pflanzenfam. iii, *2a* (1890), p. 51.

var. **Delavayi** (Franch.), Engl. et Frmscher. *Saxifraga Delavayi*, Franch. in Bull. Soc. Bot. Fr. xxxii (1885), p. 6; *Bergenia Delavayi* (Franch.) Engl. in Nat. Pflanzenfam. iii, *2a* (1890), p. 51.

"Yunnan, Chung Tien plateau. Alt. 12–13,000 ft. Dry, grassy hillsides." G. Forrest. Nos. 178, 265. 1904.

"Eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 11–12,000 ft. Stony, grassy slopes and on the margins of cane

brakes. (Plant of 1–2 ft. Flowers deep, purplish rose, non-fragrant.)" G. Forrest. No. 2410.

"May 1906. Lat. 27° 20′ N. Alt. 12–13,000 ft. Shady situations in rhododendron forests. (Plants of 9–15 inches. Flowers rose-pink.)" G. Forrest. No. 5808. June 1910.

"W. Yunnan, eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 12–13,000 ft. Moist, rocky situations on meadows. (Plant of 4–12 inches. Flowers deep rose-purple.)" G. Forrest. No. 4205. September–October 1906.

"Lat. 25° 40′ N. Alt. 11–12,000 ft. Stony, grassy situations in ravines. (Plant of 9–14 inches. Flowers pale rose-purple.)" G. Forrest. No. 5057. July 1906.

"Tibet. Mekong-Salwen divide behind Tzekou mission." G. Forrest. No. 172. 1904.

NOTA.—*Bergenia Delavayi* (Franch.) *Bergeniae purpurascenti*, valde affinis modo differt foliis adultis margine distincte crenatis ovali-obovatis paullum longioribus, floribus maioribus, ut huic sub nomine varietatis adjungatur.

LIST OF PLATES.

Illustrating Professor A. Engler and E. Frmscher's Paper on Species of Saxifraga and Bergenia collected by George Forrest in Yunnan and Eastern Tibet.

The plates are taken from photographs by Mr. R. Adam of dried specimens in the Herbarium of the Royal Botanic Garden, Edinburgh.

PLATE LXXXVII. Saxifraga humilis, Engl. et Frmscher. Sp. nov.
LXXXVIII. Saxifraga clavistaminea, Engl. et Frmscher. Sp. nov.
LXXXIX. Saxifraga micranthoides, Engl. et Frmscher. Sp. nov.
XC. Saxifraga parvula, Engl. et Frmscher. Sp. nov.
XCI. Saxifraga Bulleyana, Engl. et Frmscher. Sp. nov.
XCII. Saxifraga petrophila, Franch., var. litschiangensis, Engl. et Frmscher. Var. nov.
XCIII. Saxifraga subamplexicaulis, Engl. et Frmscher. Sp. nov.
XCIV. Saxifraga turfosa, Engl. et Frmscher. Sp. nov.
XCV. Saxifraga nigroglandulosa, Engl. et Frmscher. Sp. nov.
XCVI. Saxifraga Forrestii, Engl. et Frmscher. Sp. nov.
XCVII. Saxifraga Balfourii, Engl. et Frmscher. Sp. nov.
XCVIII. Saxifraga cinerascens, Engl. et Frmscher. Sp. nov.
XCIX. Saxifraga signata, Engl. et Frmscher. Sp. nov.
C. Saxifraga sediformis, Engl. et Frmscher. Sp. nov.
CI. Saxifraga Brunoniana, Wall. var. majuscula, Engl. et Frmscher. Var. nov.
CII. Saxifraga pulchra, Engl. et Frmscher.

Saxifraga humilis, *Engl. et Frmscher.*

Saxifraga clavistaminea, *Engl. et Frnscher.*

Saxifraga micranthoides, *Engl. et Frmscher.*

Saxifraga parvula, *Engl. et Frmscher.*

Saxifraga Bulleyana, *Engl. et Frmscher.*

Saxifraga petrophila, *Franch.*, var. lichiangensis, *Engl. et Irmscher.*

Saxifraga subamplexicaulis, *Engl. et Irmscher.*

Saxifraga turfosa, *Engl. et Frmscher.*

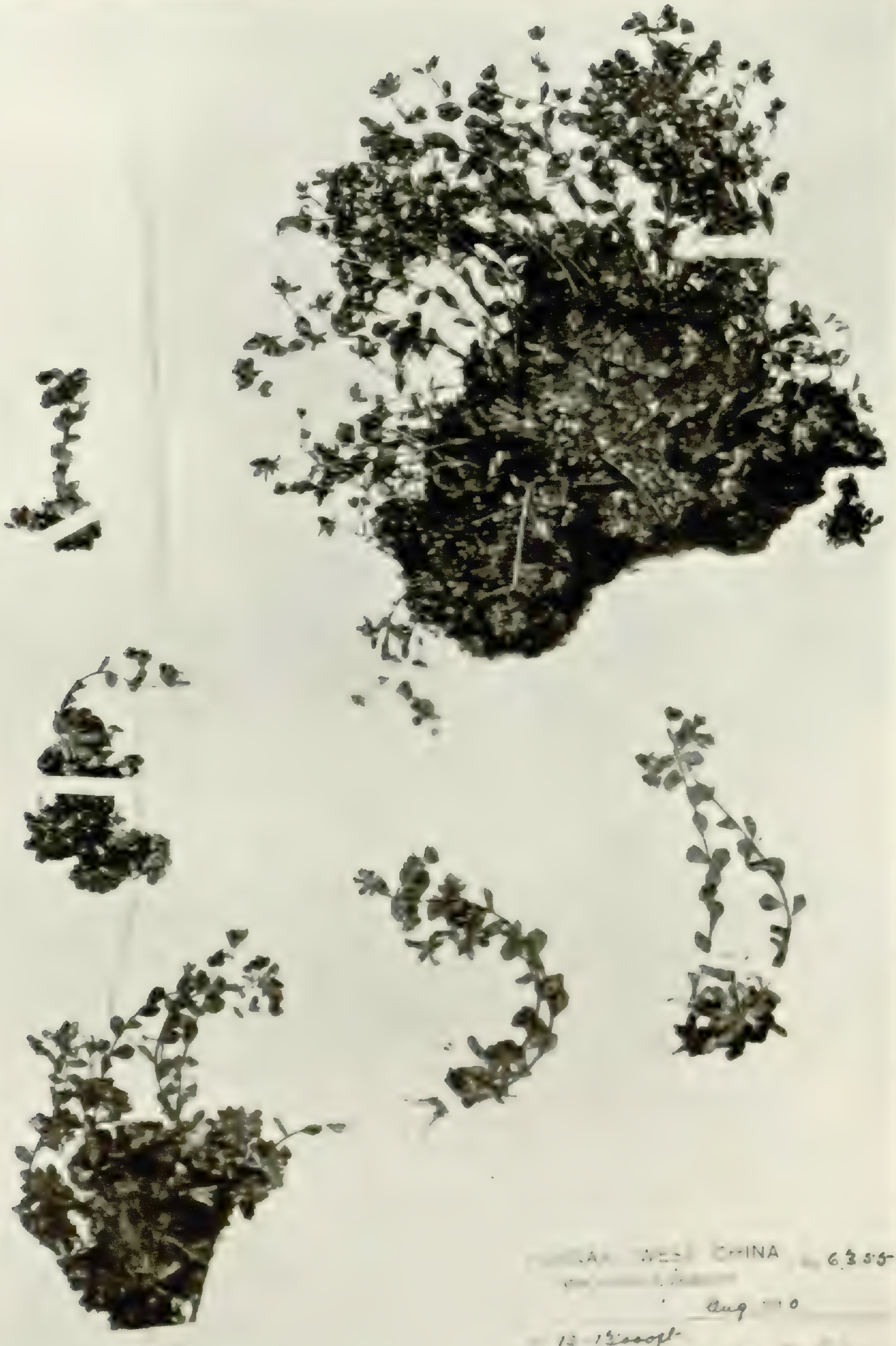
Saxifraga nigroglandulosa, *Engl. et Irmscher*

Saxifraga Forrestii, *Engl. et Frmscher.*

Saxifraga Balfourii, *Engl. et Frmscher.*

Saxifraga cinerascens, *Engl. et Frmscher.*

Saxifraga signata, *Engl. et Frmscher.*



Saxifraga sediformis, *Engl. et Irmscher.*

Saxifraga Brunoniana, *Wall.*, var. majuscula, *Engl. et Frmscher.*

Saxifraga pulchra, *Engl. et Frmscher.*

New Burmo-Chinese Species of Didymocarpus.

BY

W. W. SMITH.

With Plates CIII.–CVII.

THE descriptions of the following six species of *Didymocarpus* are based on material in the Herbaria of the Royal Gardens at Kew and Edinburgh. I am indebted to the Director of Kew for the loan of several sheets, which have been of much service.

I have not followed Kuntze in including under the generic name *Roettlera*, Vahl both *Didymocarpus* and *Chirita*. The distinguishing mark between these two genera is the character of the stigma which is entire in *Didymocarpus* and bifid in *Chirita* (Bentham and Hooker, Gen. Plant., vol. ii. p. 995). This character is, however, supported by the distinct facies of each in the field and to a certain extent a difference in habitat. The *Didymocarpi* are plants of the rock-clefts, while the *Chiritae* are usually at a lower altitude and less restricted in their choice of habitat. The difference in facies is one rather difficult to define in words, but in areas such as the Eastern Himalayas where both genera are well represented, the general aspect of each is so distinct that examination of the characters of the stigma is not necessary in determining the genus of a specimen in the field.

Exceptional forms do occur, however, in other areas. Thus *Didymocarpus Lacei*, W. W. Smith, from the Gokteik Gorge in Upper Burma is a species with the *Chirita* facies but with the stigma of the *Didymocarpi*. The genus *Didymocarpus* was recognised by Bentham and Hooker as a very polymorphic one and easily separable into sections worthy of generic rank. The number of species of this and allied genera yet to be obtained from S.E. Asia is in all probability so large that it is expedient to retain what is undoubtedly a satisfactory division in most instances. This is true especially of the *Eu-didymocarpi*. If *Chirita* is included, the position of *Didissandra* would also have to be considered, for certain species of that genus approach very

closely in aspect to *Chirita* as well as to *Didymocarpus*. The increase of the number of perfect stamens is a character not very much more secure in this order than the form of stigma. I have little doubt that *Didymocarpus* will ultimately be split up, and in that case *Roettlera* would be a fitting generic name for the present section *Orthobaea*, as suggested by Bentham and Hooker (Gen. Plant., ii. 1022).

Didymocarpus Burkei, W. W. Smith. Sp. nov. Plate ciii.

Species *Didymocarpo leucocalyci*, C. B. Clarke affinis sed inter species *Eudidymocarporum* foliis pulchre et mire pilosis distincta.

Herba erecta, circ. 30 cm. alta, habitu et magnitudine *D. leucocalyci* similis. Caulis dense fulvo-pilosulus. Folia basalia desunt ; folia caulina opposita, 2–3 paria, inaequalia, ad 15 cm. longa, ad 8 cm. lata, petiolis plus minusve 3 cm. longis fulvo-pilosulis, elliptica vel ovato-elliptica, apice obtusa, basi breviter inaequaliterque cordata vel cuneata, serrata, supra dense pilosula, pilis miro modo in nodulos aggregatis, infra uniformiter pilosula ; nervi utrinque 6–8 supra immersi, infra distinctiores. Inflorescentiae cymosae multiflorae longe pedunculatae 3–4 ad apicem caulis aggregatae, foliis paululum longiores ; pedunculi circ. 10cm. longi, subrigidi glabri rubri, ad apicem iterum atque iterum divisi; pedicelli 5–10 mm. longi graciles; bracteae ad 3 mm. longae, suborbiculares vel oblongae. Calyx 2–3 mm. longus, 2 mm. latus, glaber, fere ad imum in lobos quinque ellipticos obtusos fissus. Corolla circ. 12 mm. longa, glabra, in sicco purpurea ; tubus cylindricus 1 cm. longus, 1·5 mm. latus, superne paululum ampliatus ; lobi valde inaequales rotundati. Stamina inclusa, duo perfecta, filamentis pubescentibus antheris cohaerentibus ; staminodia duo minima vel saepe absentia. Ovarium lineare breviter stipitatum disco brevi cylindrico. Fructus immaturus 1·5 cm. longus linearis, *D. leucocalycis* ei similis.

Upper Burma. Collected by Mr. D. Burke for Messrs. Veitch. Type in the Kew Herbarium.

Didymocarpus silvarum, W. W. Smith., Sp. nov. Plate civ.

Species *Didymocarpo Burkei*, W. W. Smith valde affinis sed effusior ; foliis glabrioribus, distincte areolatis, floribus majoribus distincta.

Herba erecta vel ascendens, debilis, usque ad 20 cm. alta. Caulis minute fulvo-tomentellus. Folia basalia desunt ; folia caulina opposita, plerumque duo paria, distantia, valde inaequalia, inferiora circ. 20 cm. longa, circ. 9 cm. lata, petiolis ad 7 cm. longis tomentellis, oblonga vel elliptico-oblonga, apice obtusa,

breviter inaequaliterque cordata, grosse irregulariterque serrata, supra areolata, nervulis distinctis, pilis in medio areolarum aggregatis (ut in *Didymocarpo Burkei* sed multo minus evidenter), infra praesertim in nervis nervulisque pilosula ; nervi primarii utrinque 9–10. Inflorescentiae cymosae multiflorae longe pedunculatae, 1–3 in axillis foliorum superiorum ortae, folia inferiora aequantes ; pedunculi circ. 8 cm. longi subrigidi glabri, iterum atque iterum divisi ; pedicelli circ. 5 mm. longi graciles ; bracteae 2 cm. longae oppositae suborbiculares glabrae. Calyx 2 mm. longus, 1·5 mm. latus, fere ad imum in lobos ellipticos obtusos fissus, glaber. Corolla circ. 1·5 cm. longa, glabra, in sicco purpurea ; tubus cylindricus 1·4 cm. longus, 2·5 mm. latus, superne paululum ampliatus ; lobi valde inaequales rotundati. Stamina duo inclusa supra medium tubum inserta antheris cohaerentibus ; staminodia nulla. Ovarium lineare breviter stipitatum pubescens in fructu glabrescens, disco brevi cylindrico instructum. Fructus immaturus 1·8 cm. longus, linearis.

China:—Yunnan, Szemao; from forests at 4000 ft.; pink flowers; Henry 12463, in Herb. Kew. A species very closely allied to the Burmese *Didymocarpus Burkei*, and evidently the equivalent of that species in the Chinese area. The greater development of the peculiar arrangement of the hairs on the leaf in the Burmese plant makes a striking difference in the aspect of the two, and considering the restricted specific distribution of most *Didymocarpi*, I have thought it better to keep them distinct.

2187 var. **glandulosa,** W. W. Smith.

Valde affinis sed robustior, folia basi cuneata nec cordata, supra uniformiter parce pilosula ; pedunculi pedicellique sparse albo-glanduloso-pilosa. Fructus fere 3 cm. longus valvis utrinque solutis.

China :—Yunnan. From Manmei (?), S. of Red River, 7000 ft.; Henry 9745, in Herb. Kew. and Herb. Edin. The specimen is imperfect, scarcely equals 12463, but is very closely allied. 9745B, in Herb. Edin. in fruit only, is the same.

2191 **Didymocarpus Margaritae,** W. W. Smith. Sp. nov. Plate cv.

Species *Eudidymocarporum*, affinis *Didymocarpo Kerrii*, Craib, sed calyce ad imum in lobos lineares patentes fisso conspicua.

Herba erecta fere acaulis (inflorescentia 15–18 cm. alta) gracillima. Folia 4–6, radicalia vel subradicalia, petiolis 3–10 cm. longis pilosulis, suborbicularia, plerumque 4–5 cm., nonnunquam 8 cm. diametro, basi aequaliter cordata, serrata (pro magnitudine grossius), supra adpresse pilosa, infra praesertim in venis ; nervi utrinque 4–5, supra indistincti, infra conspicui

sed vix eminentes. Inflorescentiae, 1–2 cymosae 4–20–florae longe pedunculatae folia superantes. Pedunculi, 10–15 cm. longi, flexuosi, glabrescentes; pedicelli 5–10 mm. longi capillis albis minutis glanduloso-capitatis sparse instructi; bracteae suborbiculares vel oblongae 2–3 mm. longae. Calyx 4 mm. longus glaber fere ad imum in lobos 5 lineares subrecurvos fissus. Corolla inaequaliter bilabiata glabra aurantiaca 2 cm. longa; tubus cylindricus 1·2 cm. longus, 2 mm. latus, paululum superne ampliatus; lobi valde inaequales patentes. Stamina duo inclusa filamentis glabris, antheris cohaerentibus; staminodia in floribus dissectis desunt. Ovarium circ. 1 cm. longum lineare glabrum stylo 3 mm. longo, stigmate circulari indiviso. Fructus 2–2·5 cm. longus, linearis, in medio 2·5 mm. latus, subfalcatus, valvis utrinque solutis.

China :—Yunnan. In the mountains to the N.W. of Szemao; at 5000 ft.; flowers orange; Henry 12380 B. Types in the Herbaria of Kew and Edinburgh.

Henry 12380A, in Herb. Edin., fruiting specimen without flowers; and Henry 12380, in Herb. Edin., Szemao forests, 4800 ft., shaded cliffs, flowers orange, appear to be the same.

2193 **Didymocarpus Mengtze,** W. W. Smith. Sp. nov. Plate cvi.

Species *Eudidymocarporum* a *D. leucocalyce,* C. B. Clarke haud remota, calyce albido tenuiter membranaceo ad mediam partem vel ultra fisso conspicua.

Herba suberecta 20–40 cm. alta, caule sparse pilosulo et glabrescente. Folia radicalia desunt; caulina ad apicem approximata, opposita, 2–3 paria, subaequalia, petiolis circ. 2 cm. longis pilosulis, circ. 10 cm. longa, circ. 6 cm. lata, oblonga, apice obtusa, basi rotundata vel rarius subcuneata, margine grosse irregulariterque serrata, membranacea, supra sparse minute pilosula, subter pallidiora, sparse pilosula, venis utrinque 6–8, satis distinctis. Inflorescentiae 1–2 cymosae, circ. 10–florae, in axillis foliorum superiorum, 8–12 cm. longae, folia paululum superantes; pedunculus circ. 7 cm. longus, flexuosus, glaber, parce ramosus, pedicellis gracillimis ad 2 cm. longis, capillis minutis glanduloso-capitatis sparse instructis; bracteae 2–3 mm. longae, oppositae oblongae albidae. Flores inter minores, angustissimi, subnutantes, flexuosi, gracillimi. Calyx poculiformis 4–5 mm. longus, 2–3 mm. latus, ad mediam partem vel ultra in lobos patentes obtusos fissus, tenuiter membranaceus, albidus. Corolla circ. 2 cm. longa, breviter bilabiata, glabra, in sicco purpurea; tubus cylindricus 1·8 cm. longus, 2 mm. latus, superne paululum ampliatus; lobi valde inaequales, rotundati. Stamina inclusa, perfecta duo, filamentis glabris antheris

cohaerentibus ; staminodia in floribus dissectis desunt. Ovarium lineare glabrum disco parvo cylindrico dentato instructum. Fructus linearis vix 3 cm. longus, in medio 2 mm. latus, breviter stipitatus, valvis utrinque solutis.

China :—Yunnan. Mountains to the north of Mengtze ; at 7000 ft. ; Henry 10232. Types in the Kew and Edinburgh Herbaria.

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Didymocarpus purpureo-bracteata, W. W. Smith. Sp. nov.
Plate cvii.

Species *Rottlerae* (*Didymocarpo*) *yunnanensi*, Franch. affinis ; habitu ascendente, calyce magno tubuloso, fructibus praelongis siliquaeformibus conspicua.

Herba suberecta circ. 30 cm. alta, caule flexuoso, ad apicem sparse rufo-pilosulo, ad basin glabrescente. Folia radicalia desunt ; in parte inferiore caulis plerumque delapsa, in parte superiore 2–3 paria, distantia, inaequalia, petiolis 2–8 cm. longis, parce pilosis, circ. 15 cm. longa, circ. 9 cm. lata, ovato-elliptica vel ovata, apice breviter acuminata, basi rotundata, regulariter serrata, membranacea, supra subglabra (juniora pilis minutis albidis furfuraceis sparsis instructa), infra subglabra venulis sparse pilosulis ; nervi primarii utrinque 6–9. Inflorescentiae 1–2 in axillis superioribus cymosae 6–12–florae circ. 15 cm. longae, folia, paululum superantes. Pedunculi circ. 8 cm. longi flexuosi glabri 2–3–plo divisi, pedicellis 1–2 cm. longis ; bracteae 3 mm. longae ovatae vel ovato-oblongae, conspicuae, purpureae. Calyx 8 mm. longus, 4 mm. latus tubulosus glaber in lobos quinque breves obtusos ad quartam partem fissus. Corolla circ. 3–4 cm. longa, bilabiata, purpurea, lineis multis atro-purpureis pererrata ; tubus 2–3 cm. longus, basi 3 mm. latus, cylindricus, superne ad 8 mm. sensim ampliatus ; lobi valde inaequales, rotundati. Stamina duo inclusa antheris cohaerentibus filamentis glabris. Ovarium lineare glabrum disco cylindrico 2 mm. longo instructum. Fructus 4–6 cm. longus linearis breviter stipitatus.

China :—

Yunnan. Mountains to the S.E. of Mengtze ; at 6000 ft. ; flowers purple-pink ; Henry 9189, in Herb. Kew.

S. of Red River from Manmei ; at 6000 ft. ; Henry 9189A, in Herb. Edin.

Forests in Teng-Chen-Lin Mountains, 7000 ft. ; purplish flowers ; Henry 9746A, in Herb. Edin.

S. of Red River from Manpan ; 6000 ft. ; purple flowers ; Henry 9746, in Herb. Edin.

Didymocarpus Veitchiana, W. W. Smith. Sp. nov.

Species inter *Eudidymocarpos* ponenda, ex affinitate *D. macrophyllae,* Wall. sed habitu caulescente, calyce tubiformi breviter lobato, flore multum longiore lilacino, inter alia facile distinguenda.

Herba perennis ad 20 cm. alta. Caules multi robusti, e radice satis crassa sublignosa orti, plus minusve dense fulvo-pubescentes. Folia 2–4 paria ; petiolus ad 3 cm. longus, pubescens ; lamina ad 10 cm. longa, ad 6 cm. lata, ovata, basi inaequaliter breviterque cordata, apice subacuta, margine serrata, supra parce pilosa, infra glabra nisi in venis pilosulis, subcinerascentia ; nervi utrinque 4–5, supra impressi, infra eminentes. Cymae pro sectione pauciflorae (saepius circ. 8-floriferae) in axillis superioribus, ad 8 cm. longae, bis terve divisae, glabrae, pedunculis 2–3 cm. longis rubro-nitentibus, bracteis perlate ovatisfere orbicularibus concavis 1 cm. diametro purpureo-rubris, pedicellis saepius 3-natis plus minusve 15 mm. longis, floribus pro sectione magnis subnutantibus. Calyx 1 cm. longus, tubiformis, perbreviter (vix usque ad 1 mm.) obtuse lobatus, corollae tubo subadpressus, purpureo-rubro-nitens glaber. Corolla fere ad 4 cm. longa tubulosa subdeclinata, a basi gradatim dilatata ventricosa, inaequaliter bilabiata, lobis quinque fere aequilongis rotundatis, glabra, lilacina, circ. 16 lineis purpureis longitudinaliter pererrata. Stamina inclusa, perfecta duo, antheris cohaerentibus albo-pilosulis, filamentis glabris. Ovarium lineare glabrum ad 2 cm. longum, disco cylindrico 2–3 mm. longo flavido ornatum. Capsula matura de-est.

China :—Collected by Mr. E. H. Wilson in Yunnan, Western China. In 1902 a living plant was presented to the Royal Botanic Garden, Edinburgh, by Messrs. Veitch of Chelsea, under 15*a* W. This plant flowered in a cool plant-house for the first time in October 1909, and again in 1910. From the plant which flowered in 1911 a specimen has been dried as the type in the Edinburgh Herbarium. A figure of the plant will appear in a subsequent number of the "Notes."

"*Didymocarpus Veitchiana* is quite a striking plant, the leaves having the green sheen of a begonia, and the dark claret-purple flower-buds show up conspicuously against them. It is comparatively easy to grow, requiring a good loam mixed with plenty of leaf soil. The herbaceous stems taken from the top of the woody rootstock are easily rooted, as are the leaves if placed in a warm, moist case."—L. B. Stewart.

LIST OF PLATES.

Illustrating W. W. Smith's Paper on Didymocarpus.

The plates are taken from photographs by Mr. R. Adam of dried specimens in the Herbarium of the Royal Gardens, Kew kindly lent by the Director), and from specimens in the Herbarium of the Royal Botanic Garden, Edinburgh.

PLATE CIII. *Didymocarpus Burkei*, W. W. Smith. Sp. nov.
CIV. *Didymocarpus silvarum*, W. W. Smith. Sp. nov.
CV. *Didymocarpus Margaritae*, W. W. Smith. Sp. nov.
CVI. *Didymocarpus Mengtze*, W. W. Smith. Sp. nov.
CVII. *Didymocarpus purpureo-bracteata*, W. W. Smith. Sp. nov.

Didymocarpus Burkei, *W. W. Smith.*

Didymocarpus silvarum, *W. W. Smith.*

Didymocarpus Margaritae, *W. W. Smith.*

Didymocarpus Mengtze, *W. W. Smith.*

Didymocarpus purpureo-bracteata, *W. W. Smith.*

New Species of Craibiodendron.

BY

W. W. SMITH.

With Plates CVIII.–CX.

SINCE the publication of the ericaceous genus *Craibiodendron* in the *Records of the Botanical Survey of India*, vol. iv. p. 276, I have had the opportunity of examining additional Indo-Chinese material, chiefly in the Herbaria of Kew and Edinburgh. I found that Mr. S. T. Dunn, dealing with Chinese material in the Kew Herbarium collected by Dr. A. Henry, had marked certain sheets as representing a new genus of *Ericaceae*, an interesting confirmation of the view taken by Mr. Craib and myself in our examination of the Burmese and Siamese specimens.

A survey of this new material and comparison with a wider range of related genera than was before possible have led me to consider the new genus as more closely related to *Leucothoë* than to *Pieris* or *Lyonia*. This is supported by the somewhat imbricate, almost free sepals, the muticous anthers and the winged seeds. I find the character of the large, unilaterally winged seeds to hold good in the three species of which fruits are available.

Craibiodendron shanicum extends into Yunnan, W. China. In this province are two other closely allied species, *C. Henryi* and *C. yunnanense*; a fourth species, the imperfectly known *C. Forrestii*, was obtained by Forrest in the upper Salwin valley. What is probably a fifth species is found in Assam, C. *Mannii*, also incompletely known.

C. Henryi in its typical state is distinct enough from *C. shanicum*; in Burma, the latter, recorded from several localities, shows little variation, but in Yunnan there are forms (*vid.* Henry 9505B, in Herb. Kew et Herb. Edin.) which suggest a transition. The Khasian species and the shrub collected by Forrest in the Salwin valley are very inadequately represented, but a short description has been given here for the sake of completeness.

[Notes from R.B.G., Edin., No. XXIV., January 1912.]

To the diagnoses of new species is prefixed a note of the extended distribution of *C. shanicum*.

Craibiodendron shanicum, W. W. Smith in Rec. Bot. Surv. Ind. vol. iv, p. 277. Plate cviii.

Distribution—China :—

Yunnan, grassy mountains, north of Mengtze. Shrub, 4–5 ft. high; flowers white; alt. 5000 ft.; Henry 9505, in Herb. Kew. and Herb. Edin. (Henry 9505B, Szemao forests, 5–6000 ft.; tree, 20 ft.; white flowers. Very near the type, but the leaves sometimes acute. In Herb. Kew. and Herb. Edin.)

Burma :—Near Loimwe, Southern Shan States, MacGregor 726; at Taunggyi, Southern Shan States, Watson 234; *ibidem*, Abdul Khalil; Maymyo, Upper Burma, 3500 ft., Lace 3128, 4160; *ibidem*, Badal Khan 117; Kalay Hills, Prazer 100; Tanglabon Hills, Prazer 123; "height of tree is 20 ft.; colour of the flower white. These trees are also seen on the Lummoo Hills after leaving Mori Thannah, and on the old Shetong Road." All in Herb. Calc.; Badal Khan 117; Lace 3128, 4160; also in Herb. Kew.

Siam :—At Doi Sootep, 2300–2800 ft.; small tree about 20 ft.; A. F. G. Kerr 1282, 1282A, 1369, in Herb. Kew.

4282

Craibiodendron Henryi, W. W. Smith. Sp. nov.

Species *Craibiodendro shanico*, W. W. Smith affinis; foliis lanceolatis acuminatis, corolla minore glabra patentiore, fere ad imum fissa differt.

Arbor circ. 8–10 m. alta ramulis robustis glabris. Folia alterna, ad 15 cm. longa, 2·5–3·5 cm. lata, petiolata, lanceolata, acuminata, extrema apice subobtusa, basi cuneata, integra, subundulata, coriacea, glabra, supra nitentia, infra pallidiora glandulis minutis nigrescentibus sparse instructa; petiolus circ. 1·5 cm. longus rugosulus glaber; nervi utrinque 15–20 fere horizontales, supra impressi, infra prominuli, intra marginem anastomosantes, utrinque distincte reticulati. Inflorescentiae plures in apice ramorum racemoso-paniculatae, 15–25 cm. longae, multiflorae, glabrescentes. Flores albi parvi; bractea bracteolaeque deciduae, in siccitate plerumque desunt. Calyx ei *C. shanici* persimilis, 1–2 mm. longus, puberulus, post anthesin vix mutatus, 5-partitus; sepala fere libera, perlate ovata, subapiculata, rugosula. Corolla 2–3 mm. longa, breviter campanulata, in lobos triangulari-ovatos, subobtusos patentes fere ad imum fissa, coriacea, glabra. Stamina 10, inclusa, dimidium corollae acquantia, libera, filamentis glabris medio

incurvis et basi complanatis ; antherae basi subsaccatae, dorso muticae in tubulos duos rimis anticis brevibus dehiscentes productae. Ovarium circ. 1 mm. longum superius, 5–loculare, stylo 1 mm. longo subglabro. Fructus ei *C. shanici* similis sed minor, 8 mm. longus, 10 mm. latus, profunde 5–angulatus, seminibus alatis circ. 4 mm. longis, 2 mm. latis.

China :—

Yunnan, 6000 ft. ; Henry 13,260, in Herb. Kew. and Herb. Edin. ; Henry 10,459, in Herb. Kew.

Henry 13,137, "Szemao forests, 6000 ft. ; tree, 30 ft. ; white flowers ;" in Herb. Kew., and Herb. Calc., and Herb. Edin.

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Craibiodendron yunnanense, W. W. Smith. Sp. nov. Plate cix.

Species valde affinis *C. Henryi* sed foliis minoribus, corolla majore vix ad decimam partem fissa, fructu minore ovoideo vix depresso-globoso recedit.

Frutex ramulis gracilioribus glabris. Folia alterna 4–5 cm. longa, 1·5–1·8 cm. lata, petiolata, lanceolata breviter acuminata, extrema apice subobtusa, basi cuneata, integra, paululum undulata, coriacea, glabra, supra nitentia, infra pallidiora, glandulis minutis nigris sparse instructa ; petiolus 2–3 mm. longus rugosulus, glaber ; nervi utrinque 12–15 fere horizontales, utrinque distincte reticulati, intra marginem anastomosantes. Inflorescentiae plures terminales racemoso-paniculatae, 8–12 cm. longae, multiflorae, glabrescentes. Flores (albidi ?) ; bractea bracteolaeque deciduae, in siccitate plerumque desunt. Calyx ei *C. Henryi* persimilis, 1–2 mm. longus, glabrescens, post anthesin immutatus, 5–partitus ; sepala fere libera, paululum imbricata, late ovata, subapiculata. Corolla 4·5 mm. longa, 2·5 mm. lata, campanulata, ore contracta, in dentes triangulares erectos vix ad decimam partem fissa, glabra. Stamina et ovarium eis *C. Henryi* similia. Fructus ovoideus nec depresso-globosus, 8–9 cm. longus, 6 mm. latus, profunde 5–angulatus, seminibus unilateraliter alatis, 5–6 mm. longis, 2–3 mm. latis.

China :—

In the vicinity of Yun-nan-sen, Yunnan. Maire 1790, 2463, in Herb. Edin.

Imperfectly known species.

Craibiodendron Mannii, W. W. Smith. Sp. nov.

Species non satis nota sed *C. Henryi* valde affinis. Foliis minoribus, venis supra prominulis nec impressis, inflorescentia contractiore, sepalis patentioribus differt.

Assam :—

Near Jowai, Jaintea Hills, collected by G. Mann. *Leucothoë Mannii* King et Prain MSS., in Herb. Kew. and Herb. Calc. This plant is undoubtedly congeneric with *C. shanicum* and *C. Henryi*, but the sheets show buds and leaves only. The species may prove to be identical with *C. Henryi*, but considering its geographical position, that is unlikely.

Craibiodendron Forrestii, W. W. Smith. Sp. nov. Plate cx.

Species *C. shanico* affinis sed foliis subtus fulvo-tomentellis, nec glabris, facile distinguenda.

Frutex circ. 2–4 m. alta ramulis robustis rufo-tomentellis. Folia alterna 4–7 cm. longa, 2·5–4 cm. lata, petiolata, oblonga, apice rotundata, saepe apiculata, basi rotundata vel cordatula, integra, margine undulata, paululum revoluta, valde coriacea, supra glabra venis furfuraceo-glandulosis exceptis, pulchre et distincte reticulata, infra dense fulvo-tomentella, glandulis minutis nigris raris instructa ; petiolus 3–5 mm. longus fulvo-tomentellus ; nervi utrinque 6–7 fere horizontales, distincti, supra impressi, infra prominuli, intra marginem anastomosantes. Inflorescentia deest.

China :—

"Amongst scrub in open situations in the Salwin valley ; Lat. 26° 12′ N. Alt. 3–3500 ft. November 1905." G. Forrest 1143, in Herb. Edin.

LIST OF PLATES.

Illustrating W. W. Smith's Paper on Craibiodendron.

Two plates are taken from photographs by Mr. R. Adam of dried specimens in the Herbarium of the Royal Botanic Garden, Edinburgh, and one from a specimen kindly lent by the Superintendent of the Royal Botanic Garden, Sibpur, Calcutta.

PLATE CVIII. Craibiodendron shanicum, W. W. Smith.
CIX. Craibiodendron yunnanense, W. W. Smith. Sp. nov.
CX. Craibiodendron Forrestii, W. W. Smith. Sp. nov.

Craibiodendron shanicum, *W. W. Smith.*

Craibiodendron yunnanense, *W. W. Smith.*

Craibiodendron Forrestii, *W. W. Smith.*

NOTES

FROM THE

ROYAL BOTANIC GARDEN,

EDINBURGH.

JUNE 1912.

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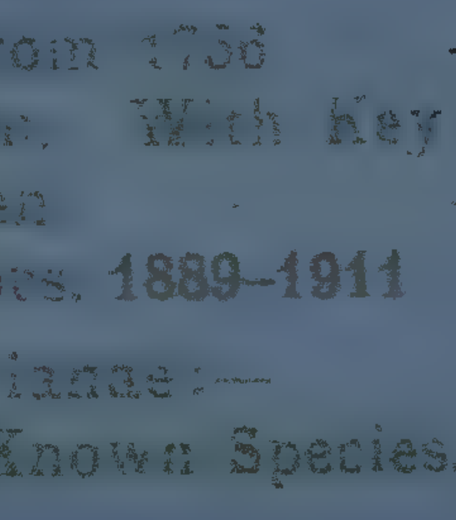

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SOLD AT THE GARDEN.

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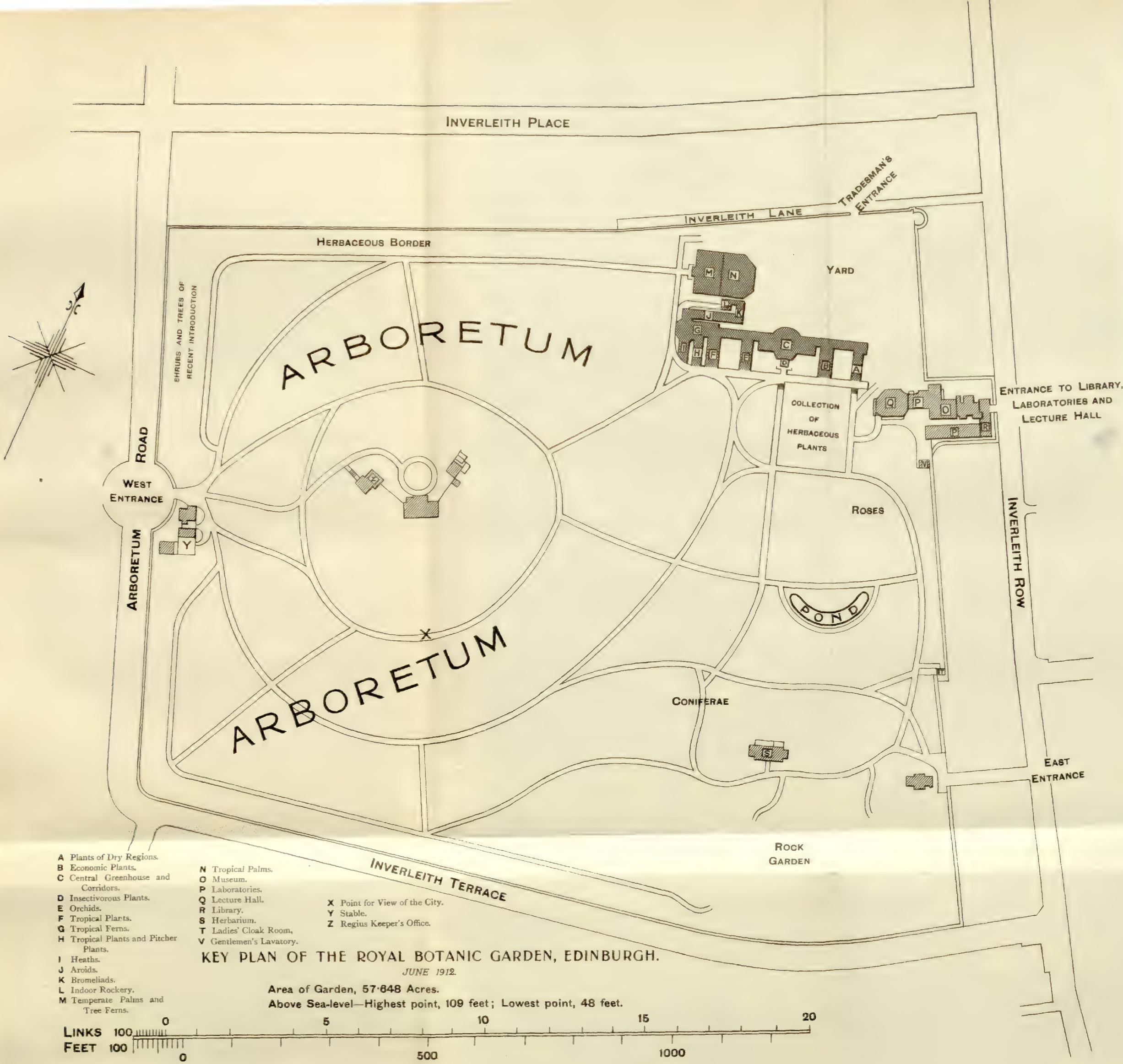

A Plants of Dry Regions.
B Economic Plants.
C Central Greenhouse and Corridors.
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T Ladies' Cloak Room.
V Gentlemen's Lavatory.
X Point for View of the City.
Y Stable.
Z Regius Keeper's Office.

KEY PLAN OF THE ROYAL BOTANIC GARDEN, EDINBURGH.

JUNE 1912.

Area of Garden, 57·648 Acres.

Above Sea-level—Highest point, 109 feet; Lowest point, 48 feet.

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THE ROYAL BOTANIC GARDEN, EDINBURGH.

THE Royal Botanic Garden, Edinburgh, is one of three Gardens maintained by the State in the United Kingdom, the others being the Royal Gardens at Kew in England, and the Glasnevin Garden at Dublin in Ireland. It occupies an unequally-sided quadrilateral area of 57·648 acres (bounded upon all sides by public roads and dwelling-houses) on the North side of Edinburgh—about a mile from the shore of the Firth of Forth. Its highest point, at Inverleith House — the official residence of the Regius Keeper of the Garden—towards the North-west, is 109 feet above sea-level, and thence the ground falls away on all sides. The lowest point—a depression 48 feet above sea-level, with an east and west trend through the middle of the Garden—is the site of an old bog, and the ground rises again to the south of the depression. The surface soil is generally alluvial sand resting on clay at considerable depth. In the lower part of the area the clay comes to the surface.

There are two entrances to the grounds—one upon the east side from Inverleith Row into the **Garden**, the other upon the west side from Arboretum Road into the **Arboretum**. The entrance to the **Library** is from Inverleith Row.

The **Garden** is open daily from **9 a.m.** on **Week-days** and from **11 a.m.** on **Sundays** until sunset.

The **Plant-Houses** are open from **1 p.m.** until **5.30 p.m.**, or until sunset if this be earlier.

The **Museum** is open on **Week-days** from **9 a.m.** until **5 p.m.** and on **Sundays** from **1 p.m.** until sunset.

The **Herbarium** is open on **Week-days** from **9 a.m.** until **1 p.m.**, and from **2 p.m.** until **5 p.m.**, excepting on **Saturday**, when it is open until **1 p.m.**

The **Library** is open on **Week-days** from **9 a.m.** until **10 p.m.**

[Notes, R.B.G., Edin., No. XXV, June 1912.]

Staff of the Royal Botanic Garden, Edinburgh, at June, 1912.

Regius Keeper	Isaac Bayley Balfour, M.A., M.D., F.R.S.
Assistant Keeper	William Wright Smith, M.A.
Assistant in Museum	Harry Frank Tagg, F.L.S.
Assistant in Herbarium	John Frederick Jeffrey.
Assistant in Library	James Todd Johnstone, M.A., B.Sc.
Assistant in Laboratory	Bertha Chandler, M.A., B.Sc.
Head Gardener	Robert Lewis Harrow.
Plant Propagator	Laurence Baxter Stewart.
Assistant Head Gardener	Samuel Stewart.
Foreman of Arboretum	Alexander Johnstone.
Foreman of Glass Department	James John Campbell.
Foreman of Herbaceous Department	Charles Dyker.
Medical Officer	James Wilson, M.D.

RULES for the Royal Botanic Garden and Arboretum in connection with the Regulations prescribed by "The Parks Regulation Act, 1872."

---

1. No unauthorised Person may ride or drive in this Garden or in the Arboretum, and no Wheelbarrow, Truck, Bath-chair, Perambulator, Cycle, or other Vehicle or Machine, is allowed to enter, except with the written permission of the Keeper. Children under ten years of age are not admitted unless accompanied by a Parent or suitable Guardian.

2. No Horses, Cattle, Sheep, or Pigs are allowed to enter.

3. No Dogs are admitted.

4. No Bags, Baskets, or Parcels, no Flowers, and no implements for games may be brought in; Artists and Photographers may not bring in their Apparatus without written permission from the Keeper.

NOTE.—*The foregoing Rules shall not apply to persons going to or leaving Inverleith House by the road leading from the Arboretum Road Gate to the House.*

5. Visitors are to enter and leave the Plant Houses by the Doors according to the Notices affixed thereon.

6. Smoking is not allowed in the Plant Houses.

7. No Person shall touch the Plants or Flowers.

8. Picnics and luncheon parties are not allowed.

9. No unauthorised Person shall Drill or practise Military Evolutions or use Arms or play any Game or Music, or practise Gymnastics, or sell or let any Commodity.

10. No unauthorised Public Address may be delivered in the Garden or Arboretum. No Performance or Representation either spoken or in dumb show shall be given in any part of the Garden or Arboretum, unless by permission of the Commissioners of His Majesty's Works and Public Buildings. No Person shall use any obscene, indecent, or blasphemous words, expressions, or

gestures, or do any act calculated to provoke a breach of the Peace, in the course of, or in connexion with, any speech, address, performance, recitation, or representation. No money shall be solicited or collected in connexion with any performance, recitation, or representation, except by permission of the Commissioners of His Majesty's Works and Public Buildings.

11. Large parties must be broken up to prevent crowding.

12. Climbing the Trees, Railings, or Fences is forbidden.

13. Birds'-nesting, and taking, destroying, or injuring Birds or Animals are forbidden.

14. The distribution of Handbills, Advertisements, and other Papers by the Public is forbidden.

Dated the 28th day of April 1904.

Sealed with the Common Seal of the Commissioners of His Majesty's Works and Public Buildings.

SCHOMBERG K. M'DONNELL,
Secretary.

Seal

Historic Notice.

In the year 1670 a small portion of ground, known as St. Ann's Yards, lying to the south of Holyrood House, and usually let to market gardeners by the Hereditary Keeper of Holyrood House, was occupied by two eminent Edinburgh physicians, **Andrew Balfour** and **Robert Sibbald**, for the making of a Physic Garden, and **James Sutherland** was appointed to the "Care of the Garden." This was the foundation of the Royal Botanic Garden of Edinburgh, which is therefore, after that of Oxford (founded in 1632), the oldest in Great Britain. The Garden was stocked with plants from the private Garden of Dr. Andrew Balfour, in which for some years he had been accumulating medicinal plants, and also in great measure from that at Livingston in West Lothian, the laird of which, Patrick Murray, was much interested in the growing of useful plants. Shortly thereafter, but at what precise date has not yet been ascertained, Sutherland became custodian of the Royal Garden, which lay on the north side of the Palace, and it became a Physic Garden for instruction, whilst the original plot in St. Ann's Yards was, apparently, given up.

In 1676 the same physicians acquired from the Town Council of Edinburgh a lease of the Garden of Trinity Hospital and adjacent ground for the purpose of a Physic Garden in addition to the Garden already existing at Holyrood, and they appointed the same James Sutherland (1639?–1719) to be "Intendant" of this Garden. The site of this Garden, which for convenience of reference may be called the Town's Botanic Garden, was the ground lying between the base of that portion of the Calton Hill upon which the prison is built and the North Bridge, and it is now occupied by a portion of the Waverley Station of the North British Railway. The name Physic Garden attached to a street in the vicinity is a reminiscence of the existence of the Garden at this spot.

About 1702 another Botanic Garden was established in Edinburgh in the ground immediately adjacent to the College

Buildings, apparently on the site of the present South College Street. This was the College Garden, and of it James Sutherland became also custodian.

Thus in the early years of the eighteenth century there were in Edinburgh three distinct Botanic or Physic Gardens—one at Holyrood, the Royal Garden; one around Trinity Hospital, the Town's Garden; and one beside the College, the College Garden—all under the care of James Sutherland.

Sutherland from the first made use of the Royal Garden for giving "instruction in Botany to the Lieges," and received a royal warrant appointing him Botanist to the King in Scotland, and empowering him to "set up a Profession of Botany" in this Garden. When the Town's Garden was created the Town Council appointed him to lecture on Botany as Professor in the Town's College, now the University of Edinburgh. In 1683 he published his "Hortus Medicus Edinburgensis, or a Catalogue of the Plants in the Physical Garden at Edinburgh," from which and from other published notices we learn that between two and three thousand plants were in cultivation. There are no data available from which to determine how these plants were distributed between the several Gardens at the date of publication of Sutherland's catalogue.

In 1706 Sutherland resigned the care of the Town's Garden and the College Garden as well as his Professorship in the University, but, remaining King's Botanist, he retained the care of the Royal Garden at Holyrood. Charles Preston (1660–1711) was appointed his successor by the Town Council, and there were thus established rival Gardens and rival Professors of Botany in Edinburgh. Charles Preston was succeeded in 1712 in his offices by his brother George Preston (1659–1749). Neither of the Prestons had ever the care of the Royal Garden.

Sutherland's appointment as King's Botanist, Keeper of the Royal Garden, and Regius Professor of Botany was held during the pleasure of the Sovereign, and on the death of Queen Anne in 1714 he was not continued in office by George I.

In 1715 **William Arthur** (1680–1716) received a commission as successor to Sutherland, but as he was implicated in an unsuccessful Jacobite plot to seize the Castle, he did not hold the office long.

He was succeeded in 1716 by **Charles Alston** (1685–1760).

In 1724 the College Garden, having fallen into disorder, was

turned to other uses; and in 1729, George Preston having retired, the Town Council appointed, as his successor in the charge of the Town's Garden and as Professor of Botany in the University, Charles Alston, who as King's Botanist had already the charge of the Royal Garden and was Regius Professor of Botany. Through him, after separation for a quarter of a century, the Royal Garden and the Town's Garden were again combined under one Keeper, and the Regius Professorship of Botany and the University Professorship were similarly united. They have so continued to the present time.

In 1763, the Royal Garden and the Town's Garden proving too small and otherwise unsatisfactory, **John Hope** (1725–1786), who had succeeded Alston in his offices in 1761, proposed a transference of the two to a more congenial site in which they could be combined. At first it was intended to secure ground to the south of George Watson's Hospital—the area upon which much of the present Royal Infirmary is built—but this not being possible, five acres of ground to the north side of Leith Walk, below the site now occupied by Haddington Place, were chosen. As Hope proposed to transfer the collections in the Royal Garden to the new Garden he was able to secure the support of the Treasury to his scheme, and the selected ground was leased in name of the Barons of Exchequer. At the same time the Town Council agreed to contribute £25 annually to the support of the Garden, this sum being the amount of rent expected from the letting of the old Town's Garden. The plants from both Gardens were transferred to the ground at Leith Walk, and from this date there has been only one Botanic Garden in Edinburgh. The site thus secured for the Garden proved, however, only a temporary one.

Daniel Rutherford (1749–1819), who in 1786 succeeded Hope in his offices, cast about him for a spot in which more ground would be available for the extension of the Garden; and eventually in 1815 nine and a half acres of the land lying to the east of Holyrood Palace, and forming the ground of Belleville or Clockmill, was fixed upon as a site. This selection gave rise to controversy which was prolonged, and Rutherford died before any arrangements for the transference of the Garden had been made.

Robert Graham (1786–1845), his successor, appointed in 1820, preferred the more open site of the Inverleith property

which the Garden now occupies, and fourteen acres of the Field or Park of Inverleith, known as Broompark and Quacaplesink, were purchased by the Barons of Exchequer from Mr. James Rocheid, its owner, in 1820, the lease of the Leith Walk Ground being sold. By 1823 all the plants had been transferred to the new Garden.

In 1858, during the Keepership of **John Hutton Balfour** (1808–1884), who succeeded Graham in 1845, a further addition, by purchase from the proprietor of Inverleith, of a narrow belt of two and a half acres was made to the Garden on the west side; and in 1865 the Caledonian Horticultural Society having resigned to the Crown its lease of the ten acres of adjoining ground which it had occupied since 1824 as an experimental Garden, this ground was also made part of the Botanic Garden. Finally the present area of the Garden was completed in 1876, when the Town Council purchased from the Fettes Trustees twenty-seven and three-quarter acres of Inverleith property on the west side of the Garden and transferred it to the Crown for the purpose of making an Arboretum in connection with the Garden; the Crown at the same time purchased Inverleith House and two and a half acres of additional ground.

In 1879, **Alexander Dickson** (1836–1887) became Queen's Botanist, Regius Keeper and Professor, and held these appointments until his death in 1887. During his term of office the Arboretum was opened to the public.

Surrounded as it now is on all sides by public roads, no further extension of the Garden upon its present site can be made.

Regius Keepers (R.K.)
from the
Foundation of the Garden.

JAMES SUTHERLAND . .	Born 1639? R.K. 12th January, 1699.* Not confirmed, 1714. Died 24th June, 1719.
WILLIAM ARTHUR . . .	Born September, 1680. R.K. 10th May, 1715. Died 1716.
CHARLES ALSTON . . .	Born 24th October, 1685. R.K. 30th June, 1716. Died 22nd November, 1760.
JOHN HOPE	Born 10th May, 1725. R.K. 13th April, 1761. Died 10th November, 1786.
DANIEL RUTHERFORD . .	Born 3rd November, 1749. R.K. 20th December, 1786. Died 15th December, 1819.
ROBERT GRAHAM . . .	Born 7th December, 1786. R.K. 31st January, 1820. Died 7th August, 1845.
JOHN HUTTON BALFOUR .	Born 15th September, 1808. R.K. 8th November, 1845. Retired 1880. Died 11th February, 1884.
ALEXANDER DICKSON . .	Born 21st February, 1836. R.K. 28th April, 1880. Died 30th December, 1887.
ISAAC BAYLEY BALFOUR. .	Born 31st March, 1853. R.K. 5th April, 1888.

* This is the date of a Royal Warrant from William III., and no earlier one has been found.

Principal Gardeners (P.G.) from the Year 1756.

(The Names of those preceding Williamson are not yet known.)

JOHN WILLIAMSON . . .	P.G. 1756? Died September, 1780.
MALCOLM M'COIG . . .	P.G. 1st January, 1782? Died 25th February, 1789.
ROBERT MENZIES . . .	P.G. 1st October, 1789. Died 22nd January, 1800.
JOHN MACKAY . . .	Born 25th December, 1772. P.G. February, 1800. Died 14th April, 1802.
GEORGE DON	Born October, 1764? P.G. 1st October, 1802. Resigned 31st December, 1806. Died 15th January, 1814.
THOMAS SOMMERVILLE . .	Born 1783? P.G. 1807? Died 17th March, 1810.
WILLIAM M'NAB . . .	Born 12th August, 1780. P.G. April, 1810. Died 1st December, 1848.
JAMES M'NAB. . . .	Born 25th April, 1810. P.G. 1st January, 1849. Died 19th November, 1878.
JOHN SADLER . . .	Born 3rd February, 1837. P.G. 13th January, 1879. Died 9th December, 1882.
ROBERT LINDSAY . . .	Born 7th May, 1846. P.G. 3rd March, 1883. Retired 31st March, 1896.
ADAM DEWAR RICHARDSON .	Born 12th September, 1857. P.G. 1st April, 1896. Resigned 31st May, 1902.
ROBERT LEWIS HARROW .	Born 26th March, 1867. P.G. 1st June, 1902.

Features of the Garden.

The method through which the Garden was built up by successive additions resulted in an absence of combination between its several parts, in great measure a consequence of want of adequate funds to make the necessary alterations in the grounds. During the past twenty-three years, in which the Garden has been wholly under the administration of the Commissioners of H.M. Works, the bringing about of this combination has been in progress. The work is not yet completed, and the Plan of the Garden which is attached to this sketch shows the area of the Garden as it is laid out at this date—June, 1912. Future editions will show further changes as the work of reconstruction proceeds.

From its foundation the Botanic Garden has been devoted to the teaching of Botany, and its usefulness in this respect has determined the laying out of its area.

Herbaceous Garden.—A considerable space is occupied by a collection of herbaceous plants arranged for study in natural orders.

Rock Garden.—There is an extensive rockwork upon which alpine and rarer herbaceous plants are cultivated.

Arboretum.—The whole of the western area of the Garden is in process of arrangement as an Arboretum of trees and shrubs, and the positions of some of the chief genera are indicated on the plan. The Coniferæ are now placed in the ground adjacent to the Rock Garden.

Herbaceous Border.—Along the North Boundary of the Arboretum a mixed Herbaceous Border has been planted.

The **Plant-Houses** are still in process of reconstruction. So far as they have been rearranged at the present time they consist of a long range to the north of the herbaceous collection, composed of a Central Green-house (**C**), from the sides of which two Corridors run east and west. In the Entrance Porch (**D**) to the Central Green-house is a collection of Insectivorous Plants. From the Eastern Corridor two houses project to the south—one

(**A**) occupied by Plants of Dry Regions, the other (**B**) containing Economic Plants of both Tropical and Temperate Regions. To the south side of the Western Corridor are attached two houses —one (**E**) for Orchids and one (**F**) for Plants of Tropical and Warm Regions. The western end of the Corridor opens into a domed house (**G**) for Ferns of Tropical Regions which are planted out, and attached to it are two houses running southwards, one of which (**H**) is occupied by Tropical Plants—Pitcher Plants are also cultivated in this house—and the other (**I**) is used as a Heath House. From the northern wing of this domed house opens a house (**J**) devoted to monocotylous Plants of Tropical and Warm Regions, specially Aroids, Scitamineæ, Liliaceæ, and Amaryllidaceæ. Out of this opens the house (**K**) for Bromeliads; and in another house (**L**) opening from this is a rockery for plants that do not thrive well in the open. Behind the western end of the Front Range there is a Temperate House (**M**) for Palms, Tree-Ferns, and Coniferæ, and a Palm-House (**N**).

Adjoining Inverleith Row is a group of buildings including the **Museum** (**O**), the **Laboratories** (**P**), the **Lecture Hall** (**Q**), and the **Library** (**R**).

The **Museum** contains a series of exhibits illustrating the form and life-history of plants, and these are arranged so as to facilitate their use in teaching.

The **Library** contains over sixteen thousand volumes. The leading botanical and horticultural periodicals are taken and may be consulted like the other books by the public. Books are not lent from the Library.

Herbarium.—In the southern portion of the Garden is the Herbarium (**S**). It contains a fair representation of the Floras of the world.

A **Ladies' Cloak-Room** is at (**T**). A **Gentlemen's Lavatory** will be found at (**V**).

From the higher ground of the Arboretum—at the point marked (**X**) on the plan—a fine panoramic view of the City of Edinburgh, flanked on the east by Arthur's Seat, and on the west by the Pentland Hills, is obtained.

Teaching in the Garden.

Special instruction in the sciences underlying the practice of Horticulture and Forestry is provided for the Staff of the Garden. The course of instruction is spread over three years, and consists of lectures upon, and practical instruction in, the sciences taught. A Reading-room and Library is also provided for members of the Staff going through the course. Young Gardeners or Foresters desiring admission to the Staff and the course of instruction should make application to the Regius Keeper.

The Regius Keeper from time to time gives lectures which are open to the Public. The Laboratories are open to anyone desirous of undertaking Botanical Research.

For more than a century and a half the offices of Regius Keeper of the Botanic Garden and Professor of Botany in the University of Edinburgh have been held by the same person, and it has become the custom that the students of the University come to the Garden for instruction in Botany.

Specimens for private study are supplied, as far as the resources of the Garden will permit, to visitors and students who make written application to the Regius Keeper. Application forms may be obtained at the office of the Garden.

Enumeration of Visitors to the Royal Botanic Garden, Edinburgh, during the Years 1889–1911.

ON the 1st of April 1889, the control of the Royal Botanic Garden, Edinburgh, was vested in the Commissioners of His Majesty's Works, and the Garden became subject to the "Act for the Regulation of the Royal Parks and Gardens, 1872." From the date specified the Garden has been opened to the public on Sundays, and also for an extended period on Week-days. The subjoined table shows the number of visitors to the Garden on Sundays and Week-days respectively during the twenty-three years which have elapsed since the Garden was transferred to the Commissioners of His Majesty's Works:—

Year.	Total in Year.	Total on Sundays.	Largest Number on a Sunday.	Smallest Number on a Sunday.	Total on Week Days.	Largest Number on a Week Day.	Smallest Number on a Week Day.
*1889 ...	368,219	187,457	13,935	129	180,762	3,834	50
1890 ...	446,540	216,345	11,262	91	230,195	4,032	65
1891 ...	454,083	220,543	9,445	340	233,540	3,228	76
1892 ...	437,205	218,233	13,581	149	218,972	2,666	43
1893 ...	531,232	271,893	12,860	45	259,339	3,197	40
1894 ...	526,948	268,793	13,515	68	258,155	3,153	28
1895 ...	516,608	264,497	15,227	127	252,111	5,292	26
1896 ...	516,407	296,576	13,517	527	219.831	3,825	30
1897 ...	475,210	271,730	16,001	74	203,480	3,153	20
1898 ...	443,289	258,499	12,840	123	184,790	3,234	39
1899 ...	461,686	259,424	15,161	105	202,262	2,758	30
1900 ...	561,359	324,856	17,700	268	236,503	3,667	53
1901 ...	586,461	339,229	19,256	258	247,232	4,627	45
1902 ...	522,363	295,892	15,561	165	226,471	5,461	60
1903 ...	606,184	355,310	19,583	135	250,874	4,202	41
1904 ...	639,066	367,292	20,719	374	271,776	3,564	42
1905 ...	584,546	330,995	19,859	100	253,551	2,708	60
1906 ...	699,558	394,030	21,959	84	305,528	3,760	44
1907 ...	674,208	422,899	25,601	708	251,309	3,365	40
1908 ...	585,171	342,106	20,549	570	243,065	2,898	39
1909 ...	683,243	394,861	24,334	165	288,382	3,483	71
1910 ...	777,864	430,776	21,813	244	347,088	3,598	80
1911 ...	708,943	420,163	22,765	82	288,780	3,828	66
Total for Twenty-three Years	12,806,393	7,152,397	...	...	5,653,996	...	...

* Numbers in this year for nine months only.

Plates illustrating new species described in this number will be issued later

Plantae Chinenses Forrestianae.

Plants discovered and collected by George Forrest during his first exploration of Yunnan and Eastern Tibet in the years 1904, 1905, and 1906.

New and Imperfectly known Species.

BY

PROFESSOR DR. L. DIELS,
Marburg.

DICOTYLEDONES.

ACANTHACEAE.

Hemigraphis drymophila, Diels. Sp. nov.

Planta 7·5–15 cm. alta. Caulis brevissimus, basi ramosus. Folia plurima basalia subsessilia vel breviter petiolata, membranacea, inprimis supra minute strigulosa, anguste obovata oblanceolata vel anguste elliptica, basin versus plerumque longe angustata, 5–15 cm. longa, 2–4 cm. lata. Rami floriferi adscendentes, scaposi nudi rarius foliis 2 oppositis minoribus praediti, 5–20 cm. longi, minutissime puberuli. Flores 2–4–ni capitati, scapos terminantes ; bracteae foliaceae involucrantes, 1–1·5 cm. longae, praecipue ad marginem basalem longius strigoso-ciliatae ; bracteolae calycem paulo superantes ciliatae. Calycis segmenta anguste lanceolata, strigosa, acuta, 6–7 mm. longa. Corolla lavandulaceo-coerulea, tubus circ. 8 mm. longus ; limbus conspicuus ; lobi 6–7 mm. longi et lati, obovati apice subtruncati. Stamina 4 subaequalia glabra, thecae obtriangulares, superiora 2 exserta. Stylus hirtus, apice in lobos 2 inaequales divisus, 12 mm. longus.

" Plant of 3–6 inches. Flowers lavender-blue. Dry, shady situations in woods at the base of the eastern flank of the Lichiang Range. Lat. 27° 10′. Alt. 8500–10,000 ft. Flow. August 1906." G. Forrest. No. 2774.

This little plant has the appearance of *H. repanda*, Lindau, a native of Java and New Guinea.

[Notes, R.B.G., Edin., No. XXV, June 1912.]

Strobilanthes cyphantha, Diels. Sp. nov.

Caulis suffrutescens, 0·45–0·6 m. altus, quadrangulus. Folia herbacea, 2–5 cm. longe petiolata, herbacea, in utraque facie paleaceo-pilosa, sicca luteo-viridia, ovata, basin versus in petiolum subdecurrentia, apice acuminata, crenato-serrata, circ. 10 cm. longa, 4–5 cm. lata. Inflorescentiae in axillis foliorum superiorum longe pedunculatae subcapitato-confertae, bracteae et bracteolae oblanceolatae vel lanceolatae, praesertim ad margines cum sepalis longe paleaceo-pilosae pilis patulis, sepala fere aequantes. Sepala aequalia linearia apice demum patentia. Corolla coerulea ampla 3–4 cm. longa extus puberula ; tubus e basi cylindrica latissime ventricosus, limbum versus subrectangulo-curvatus ; limbus brevis. Filamenta et stylus puberula. Ovarium apice barbatum.

" Half shrubby plant of 1½–2 ft. Flowers blue. Grassy situations amongst scrub on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 9–10,000 ft. Flow. June 1906." G. Forrest. No. 4549, partly.

Strobilanthes Forrestii, Diels. Sp. nov.

Suffruticosa vel herbacea. Caules 15–50 cm. alti, plus minusve glanduloso-pilosi. Folia herbacea, glanduloso-pilosa vel glabrescentia subsessilia, ovata, basi lata nonnunquam subcordata rarius cuneato-angustata, crenato-serrata, apice obtusiuscula, 2–5 cm. longa, 1·2–3 cm. lata. Inflorescentia simplex, spicata vel ramis ex axillis foliorum inferiorum additis sub-paniculata. Flores solitarii sessiles. Bracteae foliaceae, superiores integrae ovato-ellipticae ; bracteolae anguste oblongae, sepalis saepe breviores. Sepala linearia, cum bracteis bracteolisque glanduloso-pubescentia, longitudine unum cetera superans, 1–2 cm. longa, 0·2–0·3 cm. lata. Corollae coeruleae vel purpurascentis 3–3·5 cm. longae tubus e basi angusta ampliatus campanulato-cylindricus. Stylus apice paulum dilatatus ; ovarium minute puberulum.

" Plant of 6–12 inches. All parts, with exception of corolla, glandular. Flowers pale blue. Open, grassy situations in side valleys on the eastern flank of the Lichiang Range. Lat. 27° 25′. Alt. 11,000 ft. Flow. June 1906." G. Forrest. No. 2456.

" Plant of 1–1½ ft. Flowers deep blue. Dry, open situations amongst boulders on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10,000 ft. Flow. August 1906." G. Forrest. No. 2760.

" Half-shrubby plant of 1–2 ft. Flowers purplish-blue. Mountain meadows on the eastern flank of the Tali Range. Lat. 27° 40′ N. Alt. 9–10,000 ft. Flow. August 1906." G. Forrest. No. 4551.

" Plant of 6–8 inches. Flowers pale purple-blue. Open, dry situations in pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. Flow. July 1906." G. Forrest. No. 4553.

A species very variable according to habitat and elevation.

The nearest to it are *S. alatus*, Nees, and *S. Wallichii*, Nees; but the new form has sessile leaves, which are much more hairy. The upper leaves are bract-like.

Strobilanthes versicolor, Diels. Sp. nov.

Herbacea. Caules 0·18–1·2 m. alti parce pilosi demum glabrati. Folia 1–2·5 cm. longe petiolata, herbacea, supra et parcius subtus pilosa demum glabrata, ovata, in petiolum breviter angustata acuta vel caudato-acuminata argute serrata 3–5 cm. longa, 2–3·5 cm. lata. Inflorescentiae et terminales et ex axillis foliorum superiorum pedunculatae; bracteae plerumque foliaceae serratae, bracteolae sepalis aequales oblanceolato-lineares 1·2–1·5 cm. longae, 0·2 cm. latae, minute pilosulae et margine ciliatae, sepala similia sublinearia obtusiuscula aequalia. Corolla versicolor alba ad saturate coerulea dorso pubescens e basi tubulosa campanulato-cylindrica antrorsum subrectangulo curvata, circ. 4 cm. longa. Stylus et filamenta pilosula. Ovarium praeter apicem puberulam glabrum non barbatum.

" Plant of 1–4 ft. Flowers ranging from pure white to dark blue. Covering large tracts on the mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 10–11,000 ft. Flow. June 1906." G. Forrest. No. 2308.

The shape of the flower is like that of *S. inflatus*, T. Anders., of Sikkim, but both leaves and calyx are very different.

Strobilanthes xanthantha, Diels. Sp. nov.

Caules e caudice numerosi, simplices, 22–30 cm. longi, parce pilosuli. Folia breviter pedunculata, herbacea, in utraque facie praecipue ad nervos puberula, ovata, basin versus angustata, apice acuta, adpresse serrata, 3–4·5 cm. longa, 2–2·5 cm. lata. Flores spicati vel paniculati, sessiles. Sepala linearia, densius pilosa, obtusa, inaequalia, 9–14 mm. longa. Corolla flava, e basi tubulosa anguste campanulata, vix curvata, circ. 3·5 cm. longa, 1 cm. lata. Stylus pilosus apice filiformis. Ovarium glabrum.

" Plant of 9–12 inches. Flowers yellow. Dry ledges of cliffs in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. Flow. July–August 1906." G. Forrest. No. 4550.

Easily recognised from the other species of our region by its yellow flowers.

Strobilanthes yunnanensis, Diels. Sp. nov.

Frutex patulo-ramosus 0·5–1·5 m. altus. Rami stricti, juniores molliter patenti-pilosi. Folia petiolata, membranaceo-herbacea, in utraque facie paleaceo-pilosa, ovata, in petiolum cuneatim angustata, apice acuminata, crenato-serrata, 3–8 cm. longa, 2–5 cm. lata. Inflorescentiae terminales et in axillis foliorum superiorum pedunculatae. Flores sessiles. Bracteae et bracteolae ovato-lanceolatae sepalis subaequales. Sepala lanceolata, longe acuminata apiceque saepe patula, basi pallidiora subhyalescentia, margine longe ciliata, 1·2–1·4 cm. longa, 0·15 cm. lata. Corolla pallide coerulea, 4 cm. longa, e basi anguste tubulosa subcylindrica minus ampliata ; limbum versus leviter curvata. Filamenta et stylus pilosa. Ovarium barbatum.

"Moist, shady woods on pass between Chien Ho on the Yang-tse and Chin Chuan valley. Alt. 8000 ft. Flow. October 1904." G. Forrest. No. 616. This form has larger leaves.

"Shrub of 2–5 ft. Flowers bright blue. Moist, open, shady situations in thickets on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 9–10,000 ft. Flow. June 1906." G. Forrest. No. 2361.

This species has a similar appearance to *S. radicans*, T. Anders., of China, but the leaves are more hairy and the corolla more curved.

Rhinacanthus Beesianus, Diels. Sp. nov.

Caulis 0·9–1·5 m. altus, fere glaber. Folia (superiora sola adsunt) brevissime petiolata vel subsessilia, membranaceo-herbacea, anguste obovata vel oblanceolata, utrinque longe angustata, apice acuminata, margine obsolete repando-dentata vel subintegra, supra minutissime pilosula subtus glabra, 20–24 cm. longa, 6–8 cm. lata ; nervi primarii circ. 8–10 utrinque a costa abeuntes vix prominentes. Panicula terminalis subconferta, 12–15 cm. longa, 8–9 cm. lata, puberula, 25–30–flora. Flores pedicellati. Sepala 5 aequalia, linearia, acuta, costata, pilosula, 1 cm. longa, 1·5 mm. lata. Corolla amplissima, alba, fragrans, extus glanduloso-puberula. Tubus 4 cm. longus. Labium superius brevissime bifidum, retortum, viridulum, 2 cm. longum, inferioris segmenta elliptica, 2–2·5 cm. longa. Stamina 1 cm. longa.

"Plant of 3–5 ft. Flowers white. Open, dry situations on western slopes of the Yung-ping-Hsien valley, on the Teng-Yueh-Talifu Road. Lat. 25° 25′ N. Alt. 7–8000 ft. Flow. September 1903." G. Forrest. No. 1053.

This showy plant is related to *R. calcaratus*, Nees, of Khasia, Cachar, etc., but is easily recognised by its much larger flowers.

ACERACEAE.

242 **Acer Forrestii,** Diels. Sp. nov.

Arbor 7–12 m. alta. Foliorum petiolus (siccus purpureus) 2–2·5 cm. longus; lamina supra glabra, subtus pallidior glaucescens ad nervorum confluxum barbata, ceterum glabra, nervulis minute reticulata, e basi cordato-excisa trilobata, lobis caudato-acuminatis, margine toto adpresse duplo-serrata, 7–8·5 cm. longa, 5–6·5 cm. lata. Racemi foliis coaetanei, brevissime pedunculati, simplices, angusti, 6–7 cm. longi, 1·2–1·4 cm. lati, fere glabri. Sepala anguste obovata; petala anguste spathulata, circ. 3 mm. longa, sepalis longiora, fusco-viridia; discus glaberrimus.

"Tree of 25–35 ft. Flowers brownish-green. Shady side valleys on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 10,000 ft. May 1906." G. Forrest. No. 2106.

Sect. *Spicata,* Pax. Allied to *Acer sinense,* Pax, a native of Hupeh and Szechuan, but differing by the trilobed leaves serrate all round, simple inflorescences and narrower sepals and petals.

APOCYNACEAE.

23 **Alstonia yunnanensis,** Diels. Sp. nov.

Frutex 1–1·6 m. altus, rami conspicue lenticellati, ramuli virides novelli puberuli. Folia 3–4 verticillata, inaequalia, breviter petiolata, herbacea, supra fere glabra subtus pallidiora puberula, utrinque longe angustata, oblonga vel oblanceolata, acuminata, 6–14 cm. longa, 2·5–3·5 cm. lata; nervi laterales numerosi sursum arcuati supra pallidi; glandulae interpetiolares subulatae. Cymae puberulae. Flores breviter pedicellati. Sepala e basi ovato-triangulari, subulato-acuminata, nigro-striolata, 3·5 mm. longa. Corollae roseae tubus 10 mm. longus, usque ad dimidium anguste (1·8–2 mm.) cylindricus, dein ad 3 mm. ampliatus, ibique intus lanuginosus; limbi lobi subelliptici 5 mm. longi ciliolati. Fructus folliculi (an maturi?) sessiles divergentes subfalcati, anguste cylindrici, longius rostrati.

"Shrub of 3–5 ft. In woods on hills west of Yunnanfu. Alt. 7–8000 ft. Flowers pale pink. February 1905." G. Forrest. No. 592. (From about the same locality also Ducloux, 20th April 1904.)

Sect. *Blaberopus* (Hook. f. in Flor. Brit. Ind. iii (1882) 642). Allied to *A. neriifolia* Don, but differing in the more herbaceous leaves and apparently smaller follicles.

BEGONIACEAE.

Begonia Harrowiana, Diels. Sp. nov.

Bulbosa, acaulis, unifolia. Stipulae minutae. Petiolus purpureo-striatus, glaber, 5–30 cm. longus; lamina membranacea, supra parce setuloso-pilosa, subtus ad nervos eisdem pilis conspersa, ceterum glabra, basi cordata lobis basalibus margine sese tegentibus, ovata, ± inaequilateralia, antrorsum obsolete lobata, inaequaliter dentata dentibus ± mucronulatis, apice saepe acuminata acutissima, 10–25 cm. longa, 6–22 cm. lata; nervi utrinque 2 basales, paulo supra tertius, deinde magis distantes 1–2 superi a costa abeuntes. Pedunculus purpureo-striatus, 7–45 cm. longus folio plerumque brevior, supra medium saepe ramo auctus, apice flores 2–20 corymbosos gerens. Bracteae bracteolaeque setulis purpureis fimbriatae. Pedicelli graciles. Tepala pallide rosea, extus parte infera ± eisdem setulis praedita, ♂ 2 exteriora oblonga 6 mm. longa, 1·2 mm. lata, 2 interiora elliptica 7 mm. longa, 5 mm. lata; ♀ 4, 2 exteriora oblongo-lanceolata 3 mm. longa, 1·5 mm. lata, 2 interiora subrotunda 6–7 mm. longa, 6 mm. lata. Stamina longe connata, 2·5–3 mm. longa. Ovarium 3-loculare, loculo uno demum conspicue alato. Styli 2–3 mm. longi, longius connati.

"Plant of 3–6 inches. Flowers pink. On moss-covered boulders in moist, shady situations at the base of the eastern flank of the Lichiang Range. Lat. 27° 10′ N. Alt. 8500–9000 ft. July 1906." G. Forrest. No. 2647.

"Plant of 3–7 inches. Flowers pale pink. In shady pine forests on humus-covered boulders on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 9500–10,500 ft. September 1906." G. Forrest. No. 3055.

"Plant of 4–12 inches. Flowers rose. Moist, shady situations by the sides of streams in the Tali valley. Lat. 25° 40′ N. Alt. 6700 ft. June–July 1906." G. Forrest. No. 4388.

"Plant of 6–12 inches. Flowers pale rose. Rocky situations in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–8000 ft. August 1906." G. Forrest. No. 4389.

"Plant of 6–8 inches. Flowers rose. Shady situations in mixed forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9000 ft. September 1906." G. Forrest. No. 4390.

Also Delavay 3248, 3925, Henry 9677A.

A very variable plant in size; it is nearest to *B. ovatifolia*, A. DC., of the Eastern Himalaya and Khasia regions, but easily recognised by the purple bristles on the bracts, bractlets, and tepals.

BERBERIDACEAE.

Berberis leptoclada, Diels. Sp. nov.

Frutex 1·2–1·5 m. altus, rami gracillimi, arcuati, purpurei glauco-pruinosi. Spinae patentes, in ramis floriferis 4–15 mm. longae. Folia parva, coriacea, glabra, (sicca) glaucescentia subtus ± rubicunda, nervis utrinque elevatis reticulata, obovata vel spathulata, apice obtusa vel saepius breviter spinescenti-apiculata nonnunquam apice recurvata, integra vel rarius dentibus spinosis paucis marginata, 1–2 cm. longa, 0·3–0·7 cm. lata. Racemi laxiflori pauciflori, floribus 1–2 singulis additis e ramulis obsoletis quasi axillares orti, suberecti, folium superantes, 2–4 cm. longi. Pedunculi pedicellique glauci. Bracteolae flori adjunctae paucae vel nullae. Tepala exteriora suborbicularia ; interiora nectarifera, late obovata circ. 3–4 mm. longa. Stamina circ. 3 mm longa. Ovarium ovoideum apice attenuatum, stigma disciforme.

" Shrub of 4–6 ft. Flowers yellow. Dry, rocky hillsides on the descent from the Chung-Tien plateau to the Yangtze, near Tang-Tui. Lat. 27° 45′ N. Alt. 10,000 ft. September 1904." G. Forrest. No. 330.

Allied to *B. elegans*, C. K. Schneider (*B. sinensis*, Desf. var. *elegans*, Franch.), but differing by the very thin branches, broader leaves, the glaucous hue of the whole plant, longer upright racemes, and larger flowers.

Berberis centiflora, Diels. Sp. nov.

Frutex 0·6–1·5 m. altus. Rami cortice cinereo demum lutescente obtecti. Spinae superne breves. Folia in ramulis perbrevibus conferta, coriacea, supra viridia subtus lutescentia vel subcuprea, glabra, obovato-oblonga vel oblanceolato-oblonga, margine spinis erectis brevibus praedita, 3–4 cm. longa, 1–1·5 cm. lata. Flores multi (supra 20), solitarii et racemosi, fasciculati, longe pedicellati pedicellis 1·5–2·5 cm. longis. Bracteolae flori adjunctae acutae. Tepala lutea ; exteriora basin versus extus glaucescentia, bracteoliformia, triangularia vel lanceolata acuta ; interiora obovata vel late elliptica, concava circ. 5 mm. longa, 3–4 mm. lata. Stamina circ. 4 mm. longa. Ovarium angustum, stigma sessile.

" Shrub of 2–5 ft. Flowers yellow. Open situations in pine and rhododendron forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–11,000 ft. June–August 1906." G. Forrest. No. 4689.

Close to *B. laevis*, Franch., but differing by the shorter internodes, shorter and broader leaves, much shorter spines, and long-peduncled, larger flowers.

BORRAGINACEAE.

3457 **Paracaryum brachytubum,** Diels. Sp. nov.

Caules complures 30–50 cm. alti, pilosi, basi rudimentis foliorum basalium praediti, ceterum foliati. Folia caulina membranaceo-herbacea ; inferiora longius cetera brevissime petiolata, summa sessilia, ovata, acuta, in utraque facie praecipue in nervis hispida, nervi laterales utrinque 2 a costa ima abeuntes eique subaequales. Folia media circ. 4–4·5 cm. longa, 2–2·5 cm. lata. Cincinni et terminales et ex axillis foliorum summorum pedunculati. Calycis hispidi tubus hemisphaericus vel hemiovoideus, 1·5 mm. longus, limbi segmenta anguste triangularia, 2 mm. longa. Corollae coeruleae tubus brevis, 1–1·5 mm. longus, limbi lobi late elliptici vel suborbiculares, 4–5 mm. longi, 3·5–4 mm. lati ; squamulae reniformes vel meniscoideae, dense pilosulae ad faucem insertae. Stamina circ. 1 mm. longa tubo inclusa.

"Plant of 12–18 inches. Flowers blue. Open situations on mountain meadows on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 9–11,000 ft. July–August 1906." G. Forrest. No. 4474.

As the fruit of this plant is unknown, the genus remains doubtful. The plant is very similar in habit to *Paracaryum glochidiatum,* Benth., but the tube of the corolla is much shorter, the scales of the throat stouter and kidney-shaped, the inflorescence more condensed.

3630 **Cynoglossum ? Dunnianum,** Diels. Sp. nov.

Perennis ; caulis 15–35 cm. longus, hispidus. Folia basalia conferta, anguste obovata vel oblanceolata, hispidissima, 7–11 cm. longa, 1·5–4 cm. lata ; caulina minora, anguste oblonga vel sublanceolata. Inflorescentia e cymis bracteis parvis suffultis longe pedunculatis confertifloris suberectis composita ; flores ipsi cernui. Sepala hispidissima, sublanceolata, ca. 3 mm. longa. Corolla rosea et coerulea ; tubus 6–7 mm. longus ; limbi lobi suborbiculares 4 mm. diamet. Squamulae sub medio tubi insertae, tenerae, ciliatae. Stamina 4·5 mm. longa, tubo supra squamulas affixa, paulum ex fauce exserta. Stylus 4–5 mm. longus. Fructus non visus.

"Plant of 9–16 inches. Limb of corolla bright blue, tube pink. Dry, stony, open situations on hills at south end of the Lang-Kong valley, near the village of Kai-hi-dsi. Lat. 26° 25′ N. Alt. 7500 ft. April 1906." G. Forrest. No. 2004.

"Plant of 6–14 inches. Flowers blue and pink. Dry, open, stony pastureland along the base of the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–8000 ft. April-June 1906." G. Forrest. No. 4476.

Also Mengtse (Hancock No. 22) and very similar Henry 10600, 10600A. In habit this is somewhat like *Cynoglossum petiolatum* DC.

Cynoglossum triste, Diels. Sp. nov.

Caulis robustus, 0·3–0·5 m. altus. Tota pilis deversis hirsuta. Foliorum basalium petiolus 8–12 cm. longus; lamina herbacea, cordata, 6–8 cm. longa, 5–6·5 cm. lata, apice brevius longiusve acuminata, nervi primarii circ. 3–4, utrinque a costa arcuato-adscendentes. Folia caulina inferiora basalibus similia, superiora brevius petiolata, minus cordata, longiora, ovata vel elongato-ovata. Panicula e ramis 3–5 composita ebracteata. Flores initio breviter pedicellati, pedicelli demum elongati. Calyx alte partitus, segmenta lanceolato-oblonga, hirsuta, 5–6 mm. longa, 1·5–2 mm. lata, demum accrescentia. Corollae tubus brevis, latus, 2·5 mm. longus; limbi lobi atropurpurei, subovati, obtusi. Squamulae valde conspicuae, 1·5–2 mm. longae, papillosae. Antherae subinclusae. Nuculae valde complanatae, minute tuberculatae. Stylus 2–2·5 mm. longus.

"Plant of 12–18 inches. Flowers dark crimson, almost black. Moist, shady situations in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 10–11,000 ft. June 1906." G. Forrest. No. 2235.

This seems to be related to *C. nervosum*, Benth., of the Western Himalaya, but is very different in the shape of its leaves and the black and crimson flowers. In habit it is not unlike *Paracaryum glochidiatum* (A. DC.), Benth.

Omphalodes Forrestii, Diels. Sp. nov.

Caulis debilis hirsutus 0·15–0·3 m. altus. Folia inferiora petiolo ad 4–5 cm. longo praedita, superiora sessilia, membranaceo-herbacea, hispida, subtus pallidiora, elliptica vel ovato-elliptica, 4–6 cm. longa, 2·5–3 cm. lata; nervi praeter costam vix prominuli. Cymae pedunculatae axillares bracteatae. Flores subsessiles. Sepala hirsutissima, lanceolata, 4 mm. longa, demum longiores. Corollae coeruleae tubus antrorsum constrictus, 4–5 mm. longus, limbi lobi breves, 2 mm. longi, suborbiculares. Squamulae parvae, longe pilosae, 2·5–3 mm. a basi tubo insertae. Stamina omnino inclusa. Nuculae 4, 2·5–3 mm. longae, tuberculatae, apice circ. 2 mm. latae, cyatho margine integro incrassato praeditae.

"Plant of 6–12 inches. Shady situations amongst grass at the base of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11,000 ft. August 1906." G. Forrest. No. 2669.

This is nearly related to *Omphalodes trichocarpa*, Maxim. (Tangut), but much stouter, with larger, much broader leaves.

CAMPANULACEAE.

3940 **Lobelia pleotricha,** Diels. Sp. nov.

Herba subfrutescens, 1·2–1·8 m. alta. Caulis (siccus) atro-purpureus, sparse pilosulus. Folia in petiolum brevem angustata, in utraque facie pilosa, oblongo-lanceolata, acuminata, acuta, margine repando-denticulata, denticulis purpurascentibus, 6–10 cm. longa, circ. 2 cm. lata, subtus pallidiora. Inflorescentia foliosa, racemosa (rarius subpaniculata ?). Pedunculus 0·5–1·2 cm. longus, pilosus. Calycis tubus cinereo-pilosus, 0·5 mm. longus; segmenta linearia glanduloso-serrata et ciliato-pilosa, ad 1·2 cm. longa. Corolla coerulea, ad 2 cm. longa; segmenta et margine et ad nervum pilis albis ciliata, 2 superiora 3 inferiora paulo superantia.

" Half-shrubby plant of 4–6 ft. Flowers blue. Moist, shady situations in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. Flow. October 1906." G. Forrest. No. 3869.

The nearest ally of this seems to be *L. mishmica,* Clarke.

4847 **Lobelia taliensis,** Diels. Sp. nov.

Caulis simplex, erectus, glaber, 30–120 cm. altus. Folia anguste obovata vel obovato-oblonga, subsessilia, herbacea, glabra, obsolete adpresse denticulata, 3-7 cm. longa 1–2 cm. lata. Inflorescentia foliata, racemosa vel subspicata. Pedunculus brevis, 4 mm. vel brevior. Calycis tubus ad nervos nonnunquam breviter pilosulus ; segmenta linearia, denticulata, parce pilosula vel glabrata, 1–1·2 cm. longa, tubum fere triplo superantia. Corolla coerulea, 2·5–3 cm. longa, labiorum segmenta acuta, saepe apice recurva, inferiora et superiora fere aequalia.

" Erect plant of 2–4 ft. Flowers blue. Open, dry situations amongst scrub in side valleys on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 9–10,000 ft. September 1906." G. Forrest. No. 3000.

" Plant of 12–14 inches. Flowers blue. Open, moist situations on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9500 ft. October 1906." G. Forrest. No. 3868.

Allied to *Lobelia pyramidalis,* Wall. The chief characters of the new plant are the broad glabrous leaves and the nearly sessile flowers.

4649 **Codonopsis macrocalyx,** Diels. Sp. nov.

Caules scandentes, 0·4–0·6 m. alti, glabri. Foliorum petiolus 2·5–5 cm. longus ; lamina tenera, membranacea, in utraque facie parce pilosula, subtus pallida, ovata vel late triangulari-ovata, irregulariter crenato-serrata vel -dentata, 5–9 cm. longa, 4–7 cm. lata. Flores apicem caulis versus pauci, pedicellati.

Calycis tubus ca. 0·8–1 cm. longus, 2 cm. latus; dentes foliacei 2–2·5 cm. longi, 0·6–1·2 cm. lati. Corolla viridis, basi purpureo-fusca, 2·5–3 cm. longa, 1·2–1·5 cm. lata, dentes ovati acuminati. Stamina 1–1·2 cm. longa.

"Twining plant of 1½–2 ft. Flowers green, faintly tinged maroon at base. Shady situations amongst grass and scrub on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10–11,000 ft. September 1906." G. Forrest. No. 3008.

The calyx of this species is much larger than in the related *C. pilosa*, Chipp, the leaves larger, thinner, and broader, somewhat resembling those of *C. deltoidea*, Chipp, of Mount Omei.

Codonopsis Forrestii, Diels. Sp. nov.

Volubilis robusta, caulis glaberrimus. Folia petiolo 0·5–1 cm. longo praedita, herbacea, glabra, late lanceolata, antrorsum sensim angustata, obsolete et remote serrata vel subintegra, 6–9 cm. longa, 1·5–3 cm. lata. Flores axillares; pedunculus 6–8 cm. longus. Calycis tubus anguste infundibuliformis 1·2–2 cm. longus, sub dentibus 1–1·5 cm. latus; dentes ovati 1·5–2 cm. longi. Corolla ampla, intense coerulea, fere ad basin partita, segmenta oblongo-elliptica, 3·5–5 cm. longa, 1·5–2·3 cm. lata. Discus conspicue sericeo-pilosus. Staminum filamenta brevissima. Ovarium inferum, stigma amplum 4 mm. longum, 3 mm. latum.

"Common in most places on the banks of Yangtse, Yunnan. Alt. 5–7000 ft. September 1904." G. Forrest. No. 48.

Allied to *C. convolvulacea*, Kurz, but a much stouter and larger plant, differing by the broader leaves with longer petioles, and the flowers being two to three times as large.

Codonopsis Bulleyana, G. Forrest ms. in schedis. Sp. nov.

Planta foetidissima. Caulis adscendens, 22–40 cm. longus, setulosus, basi ramulos foliatos 6–10 cm. longos emittens, superne subnudus vel folio unico praeditus. Folia breviter petiolata, herbacea, utrinque dense setuloso-pilosa, cordata, 10–16 cm. longa, 10–12 cm. lata. Flos terminalis, solitarius, nutans. Calyx semisuperus, glaucus; tubus subpatelliformis, circ. 4 mm. longus, 9–10 mm. latus, glabrescens; lobi ovati, integri, margine revoluti, setulosi, 10 mm. longi, 5 mm. lati. Corolla extus hinc inde setulosa, pallida, fere hyalina, coeruleo-reticulata, basin versus intensius colorata; tubus circ. 10 mm. longus; lobi patentes 10–15 mm. longi, 10 mm. lati, ovato-triangulares. Stamina glabra ca. 8 mm. longa. Stylus perbrevis; stigma amplum obcordatum, stamina subaequans.

"Plant of 9–15 inches. Root fleshy. Flowers pale watery turquoise blue netted minutely a deeper shade. Open, grassy

slopes on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 11–12,000 ft. Flow. July 1906." G. Forrest. No. 2731.

This species is close to *C. foetens*, Hook. f. et Thoms., which has a much shorter tube and nearly globose corolla.

Codonopsis meleagris, Diels. Sp. nov.

Caulis erectus, vix nisi basi ima foliatus, 30–45 cm. altus. Folia brevissime petiolata, supra parce setulosa, subtus glauca densius setulosa, oblonga, obtusa, margine repando-dentata, 5–8 cm. longa, 1·5–3 cm. lata. Flos terminalis, solitarius, pendulus. Calyx superus, glaucus, glaberrimus; tubus hemisphaericus 6–10 mm. longus, 8–10 mm. latus; lobi lanceolato-triangulares, obtusi, denticulati, nervosi. Corolla viridulo-lutea, livido-purpureo-maculata et-venosa, campanulata, 3–3·5 cm. longa, apice 3·5–4 cm. lata; lobi erecti, subaequilateraliter-triangulares, 10–12 mm. longi. Stamina ca. 12 mm. longa, filamenta basin versus dilatata, stylum aequantia.

"Plant of 1–1½ ft. Flowers greenish-yellow, veined and marked livid purplish-lake, pendulous. Grassy openings in pine forests and on rocky slopes on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. Flow. August 1906." G. Forrest. No. 2674.

This beautiful species is related to *C. subscaposa*, Kom., but distinct in the subsessile leaves and much larger flower.

Cyananthus formosus, Diels. Sp. nov.

Perennis. Radix apice saepius pluriceps ibique rosulas hypophyllorum integrorum pallidorum subscariosorum 3–4 mm. longorum confertas gignentes. Caules complures, procumbentes vel adscendentes, flaccidi, 10–15 cm. longi; inferne glabri hypophyllis minutis remotis praediti, superne pilosi, foliati ramulosque perbreves laterales axillares confertos gignentes. Folia parva, crassiuscula, supra puberula subtus glauco- vel niveo-tomentosa, margine revoluta, obovata, rhombea vel subreniformia, integra vel alte dentata, cum petiolo cuneato 2–6 mm. longa et lata. Flores terminales ampli. Calyx campanulatus, albido-hispidus; tubus 5–6 mm. longus, 6–9 mm. latus, dentes anguste triangulares, 5–6 mm. longi. Corolla intense coerulea, tubus 15–20 mm. longus, 7–8 mm. latus, limbi lobi ovati, brevissime apiculati, 10–12 mm. longi, 5–6 mm. lati.

"Spreading plant of 4–6 inches. Flowers deep rich blue. Open situations on limestone drift on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. August 1906." G. Forrest. No. 2726.

Allied to *C. Delavayi*, Franch., but distinguished by the

rosulate scales at the top of the caudex, the broader leaves, and much larger flowers.

Cyananthus Forrestii, Diels. Sp. nov.

Annua ? e basi pluricaulis ; caules adscendentes iterum ramosi, fere a basi ramulos apice florigeros gignentes, 15–30 cm. longi, parcius pilosi. Folia sparsa, parva, breviter petiolata vel subsessilia, pilosa, obovata, pauci-serrata vel subintegra. Calyx pilosus, breviter campanulatus vix inflatus, tubus 4 mm. longus, 5–6 mm. latus, dentes triangulares 3 mm. longi, 1·8 mm. lati. Corolla cylindrica 15–20 mm. longa, 5 mm. lata, pallide coerulea ; segmenta anguste ovata vel oblonga, erecta, 6–7 mm. longa, circ. 2–5 mm. lata. Stamina 4–6 mm. longa. Stylus superne pubescens, 3 mm. longus.

"Plant of 6–12 inches. Flowers pale blue. Open, grassy situations on lava beds in the Ming Kwang valley, north of Ma chang. Lat. 25° 15′ N. Alt. 6–7000 ft. October 1903." G. Forrest. No. 955.

Allied to *C. inflatus*, Hook. et Arn., but more glabrous, and the corolla much longer.

Adenophora coelestis, Diels. Sp. nov.

Rhizoma suberosum hypophyllis pallide brunneis vel eorum vestigiis dense obtectum. Caules simplices, 20–45 cm. longi, parce pilosi vel glabrati. Folia alterna, sessilia, in utraque facie hirta vel glabrata, inferiora minora saepe angustiora, superiora lanceolata vel ovata, margine nonnunquam subrevoluto ± serrata, 3–4 cm. longa, 0·25–1·2 cm. lata. Racemi simplices, pauci- ad uniflori. Flores pedunculati cernui, pedunculi 0·5–2 cm. longi bracteolati. Receptaculum 6–8 mm. longum ; sepala lanceolata, serrata, 6–10 mm. longa. Corolla coerulea, late campanulata, 2–3 cm. longa, 2·5–3·3 cm. lata, limbi lobi semiovati conspicue acuminati, nonnunquam callosulo-mucronulati quam tubus 3–4-plo breviores, basi 8–12 mm. lati. Discus 3–4 mm. longus. Stamina basi dilatata lanuginosa. Stylus inclusus, basi glaber superne pubescens, 1·5–1·7 cm. longus.

"Plant of 1–1½ ft. Flowers bright blue. Crevices and ledges of limestone cliffs on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 10–11,000 ft. August 1906." G. Forrest. No. 2718.

"Plant of 9–12 inches. Flowers light blue. Open, barren mountain pastureland on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 10,500–11,000 ft. August 1906." G. Forrest. No. 2810.

This much Campanula-like species is recognised by the

simple, few-flowered stems, broad corolla, and the leaves being restricted to the lower half of the stem.

Adenophora Forrestii, Diels. Sp. nov.

Caulis adscendens, simplex, ad 50 cm. altus, minute pubescens, basi hypophyllis parvis remotis praeditus, longe quasi subnudus, medium versus dense foliatus, apice iterum defoliatus. Folia supra demum glabrata, subtus pubescentia, 5–7 cm. longa, 0·5–0·7 cm. lata, lanceolato-linearia, margine subintegra vel obsolete denticulata. Flores pedicellati vel subsessiles nutantes. Calycis lobi lanceolato-triangulares 5 mm. longi tubum subaequantes. Corolla coerulea, late infundibuliformis, lobi tubum 0·8–1 cm. longum aequantes vel eum subsuperantes, triangulares, acuti. Stamina e basi dilatata barbato-ciliata attenuata, anthera filamento paulo longior. Discus perbrevis, vix 1 mm. Stylus superne pubescens, demum apice trifidus, quam corolla paulo brevior.

"Hoching and Lichiang valleys. Alt. 7–8000 ft. Flow. September 1904." G. Forrest. No. 394.

This species is recognised by simple stems nearly leafless, except in the middle part, the very narrow leaves, the deeply cleft corolla, and the extremely short disc.

Adenophora ornata, Diels. Sp. nov.

Caules 0·3–1·2 m. alti, puberuli vel glabri. Folia sessilia, elongato-obovata vel obovata, argute serrata, pubescentia vel glabra, 3–6 cm. longa, 2–2·5 cm. lata. Inflorescentia saepe paniculata, remotiflora. Flores breviter pedunculati, bracteolati. Receptaculum 2–4 mm. longum, dentes anguste-lanceolati, paucidenticulati, apice subulati, patuli, 6–10 mm. longi. Corolla infundibuliformis, intense coerulea, 2–2·5 cm. longa, ore 2·5–3 cm. lata, limbi lobi late triangulares, apiculati. Discus 2–3 mm. longus, pilosulus vel glaber. Stylus inclusus, superne pubescens, 1·5–2 cm. longus.

"Plant of $1\frac{1}{2}$–$2\frac{1}{2}$ ft. Flowers bright blue. Crevices and ledges of shady cliffs in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 11–12,000 ft. August 1906." G. Forrest. No. 2801.

"Plant of 1–2 ft. Flowers bright blue. Dry, open, rocky pastureland on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. August–September 1906." G. Forrest. No. 3862.

"Plant of 2–4 ft. Flowers bright blue. Shady, moist situations on the margins of pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 3861.

This plant is related to *A. aurita*, Franch., of the Tachienlu region, but the leaves are more angustate at the base and the whole plant more glabrous.

Adenophora leptosepala, Diels. Sp. nov.

Caulis subglaber, 45–90 cm. altus. Folia breviter petiolata vel subsessilia, pilosula vel glabrata, subtus pallida, lanceolato-ovata vel ovata, apice plerumque caudato-acuminata, 5–7 cm. longa, 2–2·5 cm. lata. Paniculae amplae rami patentes. Flores graciliter pedunculati, cernui; pedunculi 1·5 ad 5 cm. longi. Receptaculum 3–4 mm. longum, dentes calycini graciles, angustissimi, patuli, 6–8 mm. longi. Corolla pallide coerulea, anguste campanulata infra os subconstricta, circ. 15 mm. longa, 6–8 mm. lata, limbi lobi vix 3–4 mm. longi. Discus anguste cylindricus, 3·5–4 mm. longus. Stylus puberulus, longe exsertus, 2–2·5 cm. longus.

"Plant of 1½–2 ft. Flowers pale blue. Open, grassy situations in and on the margins of pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–11,000 ft. September 1906." G. Forrest. Nos. 3857, 3858.

This is similar to *A. capillaris*, Hemsl., in the inflorescence, but the leaves are broader and the corolla much wider.

Adenophora Bulleyana, Diels. Sp. nov.

Caulis elatus, puberulus, ad 1·2 m. altus. Folia alterna, firma herbacea, infima decrescentia, media oblongo-ovata vel lanceolata, in utraque facie hispidula, serrata, acuminata, 5–7 cm. longa, 1·5–2 cm. lata. Paniculae amplae rami adscendentes, basi longe nudi, apice floriferi; flores saepe terni conferti. Receptaculum 3–4 mm. longum, dentes calycini anguste lanceolati, calloso-serrulati, 8–10 mm. longi. Corolla pallide coerulea, anguste infundibuliformis, 10–12 mm. longa, ore 10–12 mm. lata, limbi lobi triangulares. Discus vix 1 mm. longus. Stylus demum longe exsertus ad 2·5 cm. longus.

"Plant of 2–4 ft. Flowers pale blue. Damp, open situations in scrub on banks of streams, on low hills forming eastern boundary of the Lichiang valley. Lat. 27° 12′ N. Alt. 9–10,000 ft. August 1906." G. Forrest. No. 2653.

In habit this is somewhat similar to *A. Potanini*, Korsh., from Northern Szechuan. It is recognised by the flowers being crowded towards the top of the branches and often ternate at the rhachis of the main stem.

Adenophora megalantha, Diels. Sp. nov.

Caulis 45–60 cm. altus, basi sulcatus, glaber. Folia basi petioliformi-angustata, obovata vel obovato-elliptica, supra

pilosula subtus ad nervos setulosa, grosse-serrata serraturis subobtusis, 7–10 cm. longa, 2·5–3·5 cm. lata, nervi subtus prominentes pallidi. Flores racemosi, pedicelli 1–2 cm. longi glabrati. Calycis tubus 1–1·2 cm. longus, segmenta 1·5–2·5 cm. longa recurva, serrulata. Corolla intense et saturate coerulea ampla, ad 4·5 cm. longa; lobi apice mucronulati. Stamina fere 2 cm. longa, e basi elliptica ciliata, subito filiformi-attenuata; anthera angusta quam filamentum paulo brevior. Discus vix 5 mm. longus, margine supero breviter ciliolatus. Stylus inclusus vix 2 cm. longus.

"Plant of 1½–2 ft. Flowers deep rich blue. Crevices and ledges of cliffs in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 10–11,000 ft. Flow. August 1906." G. Forrest. No. 2661.

This is a species remarkable by the leaves being puberulous on the upper surface, and by the very large flowers.

4466 **Adenophora pachyrhiza,** Diels. Sp. nov.

Rhizoma "crasse tuberosum." Caulis 30–40 cm. altus, patenti-hispidulus, simplex. Folia sessilia, in utraque facie subtus in nervis hispidula, subtus pallidiora, lanceolata, vel oblongo-ovata, levissime brevissimeque serrata margine revoluta, apice nonnunquam acuminata, 3–5·5 cm. longa, 0·6–1 cm. lata. Racemus simplex, flores remoti, breviter pedunculati, patuli vel cernui. Receptaculum 3–4 mm. longum, sepala 6–7 mm. longa, lanceolata, calloso-serrulata, corolla intense coerulea, late infundibuliformis, 2 cm. longa, apice 1·5–2·3 cm. lata. Discus 1·2–1·5 mm. longus. Stylus basi glaber, antrorsum pubescens, inclusus, 1·5–1·7 cm. longus.

"Plant of 12–16 inches. Flowers bright blue. Thick tuber root. Dry, shady situations on the margins of pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 11,000 ft. September 1906." G. Forrest. No. 3860.

A. prenanthoides, Prain, from Lhassa, is different by its smaller, conspicuously pedunculated flowers. *A. Forrestii* is more glabrous, the leaves are softer, longer, and narrower, the disc much shorter.

4467 **Adenophora diplodonta,** Diels. Sp. nov.

Caulis ad 1 m. altus pubescens. Folia herbacea, subtus hispidula, inferiora sparsa subpetiolata, basin versus sensim cuneato-angustata deinde ovata, duplicato-serrata, acuta, 7–8 cm. longa, 2·5–4 cm. lata. Inflorescentia racemosa (vel paniculata ad 40 cm. longa); flores breviter pedunculati nonnunquam bini; pedunculi puberuli. Receptaculum puberulum, semiovoideum, vix 2 mm. longum; dentes calycis angustissime

lanceolati, patentes, superne saepe filiformes, basi utrinque paucifimbriati. Corolla anguste infundibuliformis, 2 cm. longa, 1·7 cm. lata; limbi lobi triangulari-ovati, acuti. Discus perbrevis plerumque quam 1 mm. brevior. Stylus longe exsertus, 2–2·3 cm. longus.

"Mekong and Yangtse valleys, dry hillsides. 5–9000 ft. Yunnan. September 1904." G. Forrest. No. 396, partly.

A much reduced specimen with a simple spike belongs apparently to this species. "Plant of 1–1·5 ft. Flowers bright blue. Dry, open, grassy situations, Mekong valley, near Fu-mo-Ti, Mekong-Salwin divide. Lat. 27° N. Alt. 7000 ft. November 1905." G. Forrest. No. 1066.

Another low specimen has white flowers. "Plant of 16 inches, with thick napiform tuber-root. Open mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 10–11,000 ft. September 1906." G. Forrest. No. 2986.

This species is recognised by the broad doubly or rather unequally serrate leaves. Of the long-styled species, it has the shortest disc. Otherwise the flower is not unlike that of *A. rupincola*, Hemsl., the leaves of which are much narrower.

CAPRIFOLIACEAE.

Lonicera xerocalyx, Diels. Sp. nov.

Frutex. Rami hornotini fertiles e perulis intus sericeo-pilosis nati, subrectangulo-patentes. Folia 0·5–0·7 cm. longe petiolata, herbacea, supra parce pilosula subtus glaucescentia uberius pilosa, anguste lanceolata, basi obtusa vel fere truncata, apice longe acuminata acuta, margine obsolete undulato-repanda, 6–10 cm. longa 1·8–2·2 cm. lata; nervi subtus pallidi, nervuli supra immersi. Flores plerumque in axillis bini, breviter pedunculati; pedunculus pilosus, circ. 3 mm. longus. Bracteae fuscae e basi lanceolata setaceae, pilosae, circ. 4 mm. longae, deciduae; bracteolae amplae, ovarium superantes, connatae cupulam latere interiore apertam truncatam vel obsolete bilobam 3–4 mm. longam formantes. Calyx scariosus, fuscus, amplus circ. 4 mm. longus, cupuliformis, glaber, ad basin in partes 2 obsolete brevidentatas vel subintegras irregulariter fissus. Corolla flava, extus dense pubescens; tubus 4–5 mm. longus et latus, gibbus, intus pilosus, in gibbo dense glandulosus; limbi lobi anguste oblongi, 10 mm. longi circ. 2·5 mm. lati, intus fere glabri. Stamina basi pilosa, ceterum glabra, 5–6 mm. longa. Stylus basi pilosus, 5–7 mm. longus, stigmate crasso coronatus. Ovarium glabrum.

"Shrub of 10–15 ft. Flowers yellow, non-fragrant. Fruit dull orange-yellow. Margins of pine forests on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 10,500 ft. June 1906." G. Forrest. No. 2386.

This species belongs to sub-Sect. 17 *Ochranthae* of Rehder's Synopsis (14 Ann. Rep. Missouri Botan. Gard., 1903, p. 133). It is somewhat related to *L. deflexicalyx*, Batal., and *L. trichosantha*, but easily recognised by the extraordinary development of the brown scarious calyx, whose parts look exactly like bud-scales.

Linnaea Forrestii, Diels. Sp. nov.

Frutex 1·2–1·8 m. altus. Ramuli divaricato-patentes, breves densius foliati et antrorsum floriferi, pubescentes. Folia brevissime petiolata vel subsessilia, crassa, hinc inde minutissime puberula, subtus glauca pallida, margine integra anguste recurva, ovata, basi rotundata, apice apiculata, parva, 0·8–1·2 cm. longa, 0·5–0·8 cm. lata, nervi praeter costam obsoleti. Flores in axillis solitariis, ampli, pedunculum perbrevem basi bracteis lanceolatis minutis 1–1·5 mm. longis et apice bracteolis 3–4 connatis minutissimis praeditum terminantes. Receptaculum cylindricum, pilosulum, 5 mm. longum. Sepala 5 oblonga vel oblanceolato-oblonga, trinervia, glabrata, nonnunquam purpurascenti-suffusa. Corollae roseae puberulae tubus longissimus, 30–35 mm. longus, antrorsum sensim ad 8 mm. dilatatus; limbi lobi 5, breviter obovati vel rotundati, 4·5–5 mm. longa et lata. Stamina 12 mm. longa, antherae lineares.

"Spreading shrub of 4–6 ft. Flowers rose-pink. Dry, scrubby hillsides, Salwin valley, between Shihchi-Ti and Hsia-Ku-Ti, Salwin-Irrawadi divide. Lat. 26° 15′ N. Alt. 6–7000 ft. November 1905." G. Forrest. No. 867.

This species is similar to *Linnaea parvifolia* (Hemsl.), Graebner (*Abelia parvifolia*, Hemsl.), in habit, but differs by its five sepals (instead of two) and the much longer tube of the showy corolla.

Linnaea brachystemon, Diels. Sp. nov.

Frutex gracilis ramosus, rami saepe dichotomi, basi rudimentis perularum minutarum pallidarum subnodosi. Ramuli hornotini floriferi breves, basi perulis oppositis scariosis, tum hypophyllis pallidis lineari-lanceolatis, deinde foliis 2 oppositis evolutis floribus subcoaetaneis instructi. Folia (tempore florendi) petiolo 0·3–0·5 cm. longo praedita; lamina herbacea, supra ad costam pilosa, ceterum glabra, subtus glauca venis obscurioribus reticulato-venosa, anguste ovata vel lanceolata acuminata integra apice subfalcata, 4 cm. longa, 1–1·2 cm. lata,

Flores breviter pedunculati bini, singuli perbreviter pedicellati. Receptaculum anguste conico-lineare, circ. 7 mm. longum glabrum. Sepala 4 oblanceolata, subtus glauca, glabra, 10 mm. longa, 0·15 mm. lata. Corollae tubus cylindricus extus glaber, intus pilosus, circ. 10 mm. longus, faucem versus vix ampliatus ; limbi lobi 4, breves, circ. 2·5 mm. diamet. Antherae subsessiles, breves, ellipsoideo-rotundatae. Stylus glaber 10 mm. longus.

"Shrub of 10–15 ft. Exterior of corolla pink or rose, interior yellowish-white, sweetly fragrant. Rocky, open situations amongst scrub in side valleys, eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 9000 ft. May 1906." G. Forrest. No. 2155.

This species is nearly related to *L. Zanderi*, Graebner. It differs from it by its more glabrous leaves, narrower sepals, and relatively longer corolla.

It was collected also by Delavay (*e.g.* No. 4305), and distributed as *Abelia biflora*, Turcz.

Viburnum atrocyaneum, C. B. Clarke, in Flor. Brit. Ind. iii, p. 7 (1882). Descript. ampl.

Frutex 1·8–2·5 m. altus. Rami cinereo-corticati, novelli pallidiores. Folia petiolo 0·5–1 cm. longo praedita, coriacea, utrinque glaberrima, lanceolato-oblonga, integra vel basin versus hinc inde obsolete calloso-serrulata, 4·5–6 cm. longa, 1·5–2 cm. lata ; nervi nervulique supra subinsculpti, subtus praeter costam pallidam (siccam) luteolam vix conspicui. Corymbi breviter pedunculati parvi, glabri, radii 1–1·5 mm. longi ; flores pedicellati ; pedicelli stricti circ. 1·5–3 mm. longi ; bracteolae mox deciduae. Calycis tubus 0·75 mm. longus, dentes breves triangulari-ovati. Corollae expansae 5–6 mm. diamet. tubus circ. 1 mm. longus, latus, limbi lobi circ. 1 mm. longi. Stamina 1·5–1·8 mm. longa. Drupa subglobosa 5–6 mm. diamet. ; exocarpium coeruleo-atrum laeve, endocarpium purpureum. Semen 4–5 mm. diamet. facie ventrali alte sulcatum, testa purpurea, albumen ruminatum.

"Spreading shrub of 4–8 ft. Flowers greenish-yellow, fragrant. On exposed cliffs, side valleys on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 10–11,000 ft. May 1906." G. Forrest. No. 2139.

"Shrub of 6–8 ft. Dry, shrubby hillside on descent from Sung Kwei pass to Lang Kung valley. Alt. 9–10,000 ft. Growing on chalky clay. North of Tali. December 1904, fruit." G. Forrest. No. 443.

This has not been recorded previously from China ; it was described first from the Mishmi Mountains.

CARYOPHYLLACEAE.

3688 **Silene Stewartiana,** Diels. Sp. nov.

Rhizoma breve, pluricaule. Caules adscendentes, basi ramos nonnullos steriles superne floriferos edentes, 20–35 cm. longi, basi glabri, superne pilosuli. Folia sessilia, (sicca) punctulata, glabra, lanceolata basi subamplectentia apice acuta, media circa 6–8 cm. longa, 1·2–1·5 cm. lata, superiora decrescentia. Flores pauci, longiuscule pedicellati. Calyx ovato-campaniformis, subturgidus, pallidus, nervis 10 glanduloso-pilosulis viridibus striatus, dentibus triangularibus ciliatis praeditus, 2–2·5 cm. longus, 1–1·5 cm. latus. Petala "pallide lavandulacea," parte infera obcuneata circ. 12 mm. longa, supera 10–11 mm. longa, 4–5 mm. lata, 4–fida, segmentis lateralibus quam 2 mediana brevioribus. Gynophorum circ. 4 mm. longum, ovarium 6 mm. longum, styli 3 brevi.

"Plant of 9–16 inches. Flowers pale lavender. Open, grassy slopes on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10,500–12,000 ft. August 1906." G. Forrest. No. 2672.

In habit not unlike some forms of *S. tenuis,* Willd.; but the calyx is larger, the petals with four lobes, two larger and two (lateral) smaller. I have not seen any scales on the petals; but the material being scanty, the species wants further observation.

3689 **Silene cryptantha,** Diels. Sp. nov.

Rhizoma crassum napiforme. Caules subprocumbentes, divaricato-ramosi, pubescentes, 30–50 cm. longi. Folia breviter petiolata, ad costam pilosula, ceterum glabra, ovata, marginata, 1·5–1·8 cm. longa, 0·8–1 cm. lata. Panicula ampla divaricato-ramosa. Flores pedicellati pedicellis 3–5 mm. longis sub calyce bibracteolatis. Calyx ambitu subclavatus, glanduloso-pubescens, saepe purpurascens, 5–6 mm. longus, dentes anguste ovati obtusiusculi, breves. Petala rosea, anguste spathulata, integra, 6–7 mm. longa, sub apice 1 mm. lata; squamulis nullis. Stamina 4–5 mm. longa. Ovarium clavato-cylindricum, 3·5 mm. longum, styli 3 circ. 3 mm. longi.

"Procumbent plant of 12–18 inches. Flowers bright rose. Dry, stony slopes on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 10–11,000 ft. July 1906." G. Forrest. No. 2783.

A similar plant has been collected near Yunnan-fu (Ducloux. No. 453).

Allied to *S. pachyrrhiza,* Franch., from which it differs by the much smaller flowers with very narrow entire petals. In *S. pachyrrhiza* they are bifid, have two lateral auricles and two inner scales.

Silene atrocastanea, Diels. Sp. nov.

Rhizoma crassum, radices longas emittens. Caules plures vel solitarii, dense pilosi, 10–20 cm. longi. Folia fere omnia ad basin caulis conferta ; infima parva, spathulato-obovata lata, media longiora, in petiolum 1–1·5 cm. longum angustata, lanceolato-oblonga, acuta, in utraque facie ± pilosa, 8–10 cm. longa, 2·5–3 cm. lata, nervi praeter costam vix prominuli. Folia superiora iterum valde reducta. Flores saepe cernui, solitarii, bini vel ad 6 racemum laxiflorum formantes ; pedicelli 1–1·5 cm. longi. Calyx amplissimus, turgidus, albidus nervis 10 atropurpureis striatus, pilosus, late campaniformis, ca. 1·8–2 cm. longus, 1·4–1·6 cm. latus ; tubus quam dentes triangulares fere duplo longior. Petala saturate castanea, pars infera obovata circ. 10 mm. longa, pars supera 8 mm. longa in dentes 4 subaequales anguste sublanceolatos acutos fissa, intus squamulis 2 circ. 1·5–2 mm. diamet. praedita. Gynophorum circ. 12–15 mm. longum. Ovarium 5–8 mm. longum in parte verticali coriaceum ; styli 3 circ. 6–8 mm. longi.

" Plant of 4–9 inches. Flowers deep maroon. Ledges and crevices of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 3043.

Allied to *S. scopulorum*, Franch. (Plant. Delavay., p. 85, Plate xxii.), but the stems are shorter, the cauline leaves much fewer, the calyx longer and much broader, the gynophore longer. The petals are very similar in both species and of nearly the same size.

Arenaria Forrestii, Diels. Sp. nov.

Caules basi squamis pallidis brunneis obtecti superne foliati, 5–10 cm. longi uno latere pubescentes. Folia superne conferta, glabra, crassiuscula, margine atque apice indurata, ovata, apice mucrone brunneo vel pallide fusco saepe incurvo subspinescenti-acutissimo ornata, 5–8 mm. longa, 2–3 mm. lata ; nervi praeter costam obsoleti. Flores subsessiles terminales solitarii. Sepala foliis similia, anguste hyalino-marginata, basin versus parce ciliata, 7–8 mm. longa, 2·5–3 mm. lata. Petala obovata apice obtusa, 8–10 mm. longa, 5 mm. lata. Stamina 10, episepala, extus basi squamula praedita, 6 mm. longa, antherae violaceae. Ovarium 2·5 mm. longum, circ. 6-ovulatum ; styli 3 apice extrorsum curvati, 3–3·5 mm. longi. Fructus adhuc ignotus.

" Plant of 2–4 inches. Flowers white, anthers violet. In crevices of limestone cliffs on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 2915.

This very distinct species looks very much like some *Cerastium* of the European Alps.

Arenaria napuligera, Franch., in Bull. Soc. Bot. France, xxxiii, 429. Plant. Delavay., p. 92, Plate xxiv*a*.

Species vix annua. Flores nonnunquam albi, antherae violaceae. Styli 3.

"Plant of 3–6 inches. Flowers white, anthers violet. Ledges and crevices of cliffs in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 11–12,000 ft. August 1906." G. Forrest. No. 1881.

"Tufted plant of 3–5 inches. Ledges and crevices of limestone cliffs on the eastern flank of the Lichiang Range. Lat. 27° 25′. Alt. 11–12,000 ft. July 1906." G. Forrest. No. 2622.

Arenaria ionandra, Diels. Sp. nov.

Caules e basi ramosissimi purpurascentes, 7–10 cm. alti, in uno latere dense glanduloso-hirti. Folia crassiuscula, remota, spathulata, recurva, 3–5 mm. longa, glabra. Flores pedunculati. Sepala glabra oblonga, late hyalino-marginata, basi paulum saccata ibique atropurpurea, 4–4·5 mm. longa, 2 mm. lata. Petala late obovato-elliptica apice conspicue emarginata, 5 mm. longa, 5–6 mm. lata, alba. Stamina 4 mm. longa, antherae violaceae. Ovarium subglobosum 1·5 mm. diamet., styli 2, breves, 1 mm. longi.

"Plant of 3–4 inches. Flowers white, base of petals yellowish, anthers violet. On limestone drift in pine forests at base of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 2902A.

In habit this species is very similar to *A. napuligera,* but differs by the glabrous calyx and having two styles only. A very similar form was collected near Yen-tze-hay by Delavay, No. 4322, in Herb. Paris.

Arenaria longistyla, Franch. var. **pleurogynoides,** Diels. Var. nov.

Typo omnibus partibus major; pedunculi 5–6 cm. longi. Folia 1·2–2 cm. longa. Sepala 6–7 mm., petala ad 10 mm. longa, 7–8 mm. lata. Styli speciminis Forrestiani 3 mm. longi.

"Plant of 3–4 inches. Flowers white, anthers violet. On limestone drift at base of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 12,000 ft. September 1906." G. Forrest. No. 2902.

This variety looks extremely like *Pleurogyne carinthiaca. A. longistyla* differs from *A. ionandra* in its long-pedunculated flowers, the longer and narrower leaves, and the rounded, not

emarginate, petals. The length of the style is a variable character of the species. It may be a case of heterostylic condition. In fact, this assumption is strengthened by d'Apreval's plate (Plant. Delavay., Plate xxiv.), which figures two forms of ovary in *d* and *e*: a long-styled and a short-styled one. Therefore, Franchet's section *Macrogyne* is invalid, his *A. longistyla* being, indeed, closely related to his *A. napuligera*. Our *A. ionandra* is an intermediate form between those two species.

COMPOSITAE.

Pluchea Bulleyana, J. F. Jeffrey. Sp. nov.

Planta biennis viscosa 30–80 cm. alta, basi ramosa, dense glanduloso-villosa. Folia caulina obovato-spathulata vel oblanceolata, apice mucronata, basi in caulem interrupte alatum late decurrentia, 5–8 cm. longa, 1–1·5 cm. lata, integerrima; folia juvenilia basalia perlate ovata vel elliptica, circ. 7 cm. longa, circ. 5 cm. lata, in petiolum circ. 2 cm. longum subabrupte attenuata. Inflorescentia terminalis, folioso-corymbosa; capitula plurima 7 mm. longa, 4 mm. diamet., heterogama disciformia, alba; flores exteriores multiseriati, styli ramulis patentibus filiformibus; flores interiores, styli ramulis truncatis non patentibus, apice papillosis, antheris flavidis caudatis, connectivo apice producto. Pedunculi bracteati, molliter pubescentes. Involucri bracteae pauciseriatae, exteriores latae obtusae hyalinae pallido-brunneae, interiores angustiores, acutae. Achaenia minuta subteretia minus quam 1 mm. longa, minute muriculata. Pappi setae uniseriatae, numerosae, molles, liberae.

"Plant of 1–2½ ft. Flowers bright yellow. Dry, rocky situations on the descent from the Lu-po pass to the Salwin, Mekong-Salwin divide. Lat. about 27° N. Alt. 8–9000 ft. N.W. Yunnan. November 1905." G. Forrest. No. 1073. Yunnan-sen, E. E. Maire. Nos. 18, 707, 2288.

A much-branched, viscid, leafy plant, densely clothed, especially the stem and inflorescence, with villous hairs, the capitula almost cottony. Flowers bright yellow. The whole plant of a yellow hue, and aromatic when dry, suggestive of some species of *Helichrysum*. Mr. Forrest says:—"Strongly aromatic when fresh. Smell almost similar to that of curry powder." Stem conspicuously winged by reason of the decurrent leaf bases, woody at base only with a fibrous tap root.

A very distinct species, the nearest ally that I have seen being *P.? pteropoda*, Hemsl. Following Mr. Hemsley's suggestion I place this in *Pluchea*, to which it is most nearly allied by the broad, blunt, subscarious involucral bracts, bifid styles of

sterile flowers, caudate anthers, and corymbose inflorescence, although the foliage rather recalls *Laggera*.

[It was collected also in silvis pr. Kichan, 30th December 1889. (Delavay. No. 4621, in Herb. Paris, "Laggera.")—Diels.]

4153 **Aster Harrowianus,** Diels. Sp. nov.

Caulis superne pubescens, praeter inflorescentiam atque ramulos axillares breves foliatos subsimplex. Folia herbacea, minute glandulosa atque supra brevissime stellato-puberula, subtus glaucescenti-villosa, demum magis glabrescentia, subsessilia vel brevissime petiolata, lanceolata acuta, leviter repando-dentata dentibus mucronulatis, 10–12 cm. longa, 2·3–2·5 cm. lata; nervi a costa prominente ca. 12–14 abeuntes, subtus prominuli infra marginem conjuncti. Inflorescentia corymbosa multiflora. Flores pedicellati, pedicellis gracilibus. Involucri phylla extus villosula, exteriora 2·5 mm. longa, interiora 4 mm. longa, lineari-lanceolata apice ciliolato purpurea. Ovarium anguste obovatum, pilosum, 2 mm. longum. Flores radiati: corollae tubus tenuis ca. 3 mm. longus, lamina alba, patula, 4–5 mm. longa. Flores disci: pappi pili albidi vel rubicundi corollam aequantes; corollae pars infera angusta 1·5 mm. longa, supera anguste campanulata, 2·5 mm. longa.

"Shrub of 3–5 ft. Ray florets pale purplish-blue, disc florets orange-yellow. Moist, rocky situations in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. September 1906." G. Forrest. No. 4004.

4153a var. **glabratus,** Diels. Var. nov.

Folia magis glabrata. Inflorescentia minor, flores paulo majores.

"Shrub of 3–5 ft. Flowers purplish-blue. Shady, rocky situations in side valleys on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 9500–11,000 ft. July 1906." G. Forrest. No. 2508.

Allied to *A. Cavaleriei*, Léveillé, of Kuei chou, but the leaves are more dentate, the nerves more spreading, the corymbs larger, heads smaller, and the pappus is less reddish than in the species of the French author.

4155 **Aster Bulleyanus,** J. F. Jeffrey. Sp. nov.

Affinis *A. Bietii*, Franch., *A. Vilmorini*, Franch., *A. Delavayi*, Franch., et *A. yunnanensi*, Franch., sed pappi longitudine et coloratione differt.

Caulis simplex circ. 30 cm. altus, inferne bene foliatus, monocephalus, sulcatus, pilis albo-villosis plus minusve vestitus. Rhizoma repens, sat crassum. Folia 6–9 cm. longa, usque ad 2·5 cm. lata, ovato-lanceolata acuta vel subacuta trinervia,

basalia in petiolum circ. 5 cm. longum late alatum sensim angustata, caulina amplexicaulia, omnia remote apiculato-dentata, utrinque sparse albo-villosa, densius infra in nervis. Capitulum 7–8 cm. diam.; phylla biserialia lanceolata acuminata dense albo-villosa; flores radii anguste lineares circ. 3·75 cm. longi; achaenia 3 mm. longa, obovata, compressa, pilosa, margine et faciebus valide uninervia; pappus inaequalis fusco-rufus, uniseriatus, achaenio vel flosculo brevior.

"Moist, shady places on western slopes of Kari pass, on descent to Shu-pa valley from Pung-tzu-la to Shi-zo. Elevation 13,000 ft. Flowers deep blue. Yunnan, September 1904." G. Forrest. No. 661.

I have described the plant from a single specimen of Mr. Forrest's. There is also a specimen in the Kew Herbarium, coll. Hosie, without number, which is in my opinion the same.

Aster Jeffreyanus, Diels. Sp. nov.

Rhizoma unicaule. Caulis strictus, pilosus, 15–25 cm. longus. Folia basalia petiolata petiolo 1–1·5 cm. longo; lamina ovata vel oblanceolata, apice acuta, subtus ad nervos pilosa, integra, 3–5 cm. longa, 1–1·7 cm. lata. Folia caulina mox parva, erecta, sessilia, 1–1·5 cm. longa. Capitulum cum ligulis 4–5 cm. diamet. Involucri phylla pauciseriata, basi parce pilosa, ceterum glabra, firma, anguste ovata, 7–8 mm. longa, 3–3·5 mm. lata. Ligulae lavandulaceo-coeruleae, anguste lineares, 15–18 mm. longae, 1·5 mm. latae; florum disci corolla 2·5–3 mm. longa. Achaenium valde compressum, obovatum vel fere obcordatum, 2·5 mm. longum, glabrum. Pappi pili setiformes, rufi, breves, inaequales, quam achaenium multo breviores.

"Marshy hillsides, base of Lichiang peak, Lichiang valley. Alt. 10,000 ft. Ray florets deep lavender, disc florets rich orange. September 1904." G. Forrest. No. 669.

Close to *Aster Souliei*, Franchet, from the region of Tongolo, but differing by the acute leaves, the longer involucral bracts, and glabrous achenes.

Erigeron patentisquama, J. F. Jeffrey. Sp. nov.

Affinis *E. uniflora*, Linn, sed foliis caulinis majoribus, pedunculo apice incrassato, involucro dense albo-tomentoso, phyllariis exterioribus patentibus atque reflexis differt.

Planta perennis, undique villosa, radice sat crassa fibrosa; scapi plures robusti satis foliosi. Folia basalia numerosa rosulatim conferta, spathulata, 4–5 cm. longa, 1–2 cm. lata, in petiolum 2–3 cm. longum sensim attenuata, margine integra, sparse villosa, supra nitide viridia, nervis paucis vix ad apicem adscendentibus, folia caulina anguste lanceolata, subacuta vel

acuta vel acuminata, saepe mucronata, basi lata, 2–3·5 cm. longa. Capitula solitaria 12–14 mm. diam.; ligulae pallido-roseae vix phyllaria superantes; disci flores sordide flavo-purpurei. Phyllaria villosissima, exteriora patentia atque reflexa, 1–1·5 cm. longa. Receptaculum planum, 8 mm. latum. Achaenia obovoidea, compressa 2–3 mm. longa, 1 mm. lata, pubescentia, pappo albido 1–1·5 cm. longo.

"Dry grassland on summit of Kari pass, Yangtse-Mekong divide, between Shih Pa and Yeh Chih, Yunnan. Flowers rose-pink. Alt. 14,000 ft. Lat. 27° 50′ N. September 1904." G. Forrest. No. 43.

This species differs from all the forms of *E. alpinus*, Linn. (*see* Fl. Brit. Ind. iii, pp. 255–256), by its stouter habit much branched from the base, with the outer phyllaries spreading and reflexed, leafy stems and villous involucre. From *E. multiradiatus*, Benth., the more villous involucre readily distinguishes it. In Forrest's plant the phyllaries lengthen in fruit and are sharply acuminate. The spreading villous hairs of the stem are very characteristic.

De Candolle's description of *Heterochaeta erigeroides* (DC. Prod. v, 282) strongly suggests the present plant, but the outer pappus in *E. patentisquama* can hardly be said to be developed, and De Candolle's is described as having the stems leafy only at the base and only 3 to 4 inches high.

I have taken up Mr. Clarke's MS. name in the Kew Herbarium on the sheet of his No. 30713 from Tilail, 12,000 ft., Kashmir. Sir J. D. Hooker has noted on this sheet that Clarke's plant was "not seen when F.B.I. was done." Jaeschke 256, Lahul, Thibet, has also been identified by Sir J. D. Hooker in Herb. Kew as var. *patentisquama*. Cf. also Duthie 11654, from Dras valley, Baltistan, 11–12,000 ft., and Lace 1672, from above Tindi, Chamba State, 12,000 ft.

Artemisia codonocephala, Diels. Sp. nov.

Caulis strictus, erectus, 0·8–1 m. altus, adpresse pilosus ramis adscendentibus auctus. Folia inferiora breviter petiolata vel subsessilia, 10–12 cm. longa, pinnatisecta, supra parce villosa vel glabrata 2–4, late linearia (ad 6 mm. lata) acuta, simplicia vel alte bifida, margine integra; nervi praeter costam occulti. Folia ramorum et caulis superi multo breviora, simpliciora, trifida vel summa demum integra. Inflorescentia paniculata. Rami floriferi spicam secundam basi foliatam apice saepe decurvam nutantem gerentes. Capitula subsessilia, inferiora spicae 1–3 fasciculata, superiora solitaria, bractea brevi suffulta, omnia deversa pendula, involucri phyllis apice extrorsum patulis ambitu fere campaniformia, 6–7 mm. longa. Involucri phylla

exteriora breviora, interiora mediano viridia ceterum scarioso-hyalina, arachnoideo-pilosa. Flores ♀ circ. 6–8, ☿ 10–16; corolla ☿ 3–3·5 mm. longa, extus glandulosa.

"Dry, barren grassland. Head of Chien Chuan valley. Alt. 8000 ft., 1904." G. Forrest. No. 637.

It was collected also by Delavay (No. 2943, in Herb. Paris, named "*A. vulgaris*, L." by Franchet).

This remarkable form of the *vulgaris*-affinity is recognised by the entire leaf-segments, nodding spikes, and bell-shaped heads. The inflorescence is similar to that of *A. Argyi*, Lév. et Vaniot, but this has quite different lower leaves.

Artemisia yunnanensis, J. F. Jeffrey. Sp. nov.

Affinis *A. vulgari* sed habitu foliisque maxime differt.

Caulis gracilis striatus albo-sericeus, basi suffrutescens, ramulis multis gracillimis foliosis. Folia infima non visa; mediana 5–7 cm. longa, 1–pinnatifida, circumscriptione ovato- vel obovato-cuneata, superiora trilobata lobis integris rotundis apiculatis, suprema ovato-lanceolata integra, fere omnia basi auriculata, supra pubescentia, infra dense canescenti-villosa. Capitula 2 mm. diam., pauca, solitaria, rarius 2–3 approximata ramos laterales terminantia vel in apice inflorescentiam spiciformem elongatam laxissimam gracillimam formantia.

"Hoching and Lichiang valleys, Yunnan; dry ground base of hills. September 1904." G. Forrest. No. 674.

[A similar plant is Delavay, No. 612. ("Che cho tse au-dessus de Tapintze"), but it has the flowers much more numerous. Franchet named it "*Artemisia vulgaris*, L., forma *indica*," in Herb. Paris—Diels.]

Although at first sight very distinct from any of the forms of *A. vulgaris*, Linn., this plant, after further observation with fuller material from the Indo-Chinese region, may have to be placed under that protean species. Indeed there is a specimen from China in the Kew Herbarium (Henry 64) closely approaching the present plant which has been named provisionally by Prof. D. Oliver *A. vulgaris*, var. ? This differs from Forrest's chiefly in the fewer and larger capitula.

The habit is more slender and graceful than that of *A. vulgaris*, Linn.

Tanacetum adenanthum, Diels. Sp. nov.

E basi pluricaulis atque stolones breves foliatos holosericeos emittens. Caules superne ramosi, circ. 30 cm. alti, pilosi. Folia sessilia 1–2–plo pinnatipartita, 1–1·5 cm. longa; segmenta utrinque 1–3 saepe subfalcata, integra vel trisecta, angustissime linearia acuta, glabrata saturate viridia subtus albo-tomentosa.

Corymbi laxiflori. Capitula pedunculata, 3–4·5 mm. longa, 4–5 mm. lata. Involucri phylla mediano (sicca) fusca, ceterum pallida scariosa, parce pilosa, elliptica vel obovata nonnunquam margine lacera, circ. 4 mm. longa, 1·5 mm. lata. Receptaculum conicum. Corolla extus glandulis amplis praedita.

" Plant of 6–12 inches. Flowers bright orange ; whole plant strongly aromatic. Dry, open, rocky situations on the eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 10–11,000 ft. October 1906." G. Forrest. No. 3070.

This species is not far from *T. tibeticum*, Hook. f. et Thoms., but the stems are longer, the leaves have longer and more acute segments, the heads are smaller, the involucral bracts narrower.

Tanacetum yunnanense, Jeffrey. Sp. nov.

Affine *T. longifolio*, Wall., sed foliis caulinis latioribus, et capitulis floribusque minoribus differt.

Caulis erectus, 40–50 cm. altus, sulcatus, supra subaraneoso-villosus, infra glabrescens purpurascens. Folia radicalia desunt ; caulina 5–8 cm. longa, petiolo 2–3 cm. longo praedita, circumscriptione late oblongo-ovata, tripinnatifida segmentis ultimis linearibus, laxe villosa. Capitula dense corymboso-conferta, dense albo-lanato-villosa ; phyllaria exteriora ovato- vel obovato-lanceolata, obtusa vel acuta, interiora oblongo-obovata marginibus scariosis irregulariter serratis, nigro-rufis. Capitula 6–7 mm. diam., 20–30–flora ; corolla circ. 2 mm. longa, minute glanduloso-pubescens ; achaenia oblonga curvata 4–angulata, corollae aequilonga ; pappus nullus.

" Base of cliffs on summit of Kari pass, Mekong-Yangtse divide. Elevation, 15,000 ft. Height of plant, 18 inches. Flowers yellow. Yunnan, September 1904." G. Forrest. No. 53.

Its nearest ally, *T. longifolium*, Wall., from which it may readily be distinguished by the smaller capitula and broader cauline leaves, is known only from Western Himalaya. A plant from Leetee, Edgeworth 96, in the Kew Herb. from Herb. Benth., with pencil note " sp. distincta," may possibly be this species, but it is in bad condition and I have not dissected the capitula.

Anaphalis chlamydophylla, Diels. Sp. nov.

Planta dense caespitosa, stolonifera. Folia pristina sicca persistentia, annua basalia (praecipue caulium sterilium) rosulata, patentia, latissime ovata, brevia, 4–8 mm. longa, 3–4 mm. lata, lanuginoso-tomentosa ; folia caulina (praecipue caulium florentium) magis remota, erecta vel cauli adpressa, basalibus longiora, oblonga, 1·5–2·5 cm. longa, circ. 0·5 cm. lata, pilis lanuginosis dense cohaerentibus quasi pallio albo lucido circumcirca involucrata, enervia. Capitula e foliis summis cingentibus demum

exserta, subsessilia, conferta, ca. 6–8 mm. diamet. Involucri phylla late lanceolata, parte infera brunnea, parte supera radiante acuta, alba, lucida, 5–6 mm. longa.

"Plant of 1–5 inches. Flowers pale yellowish-white. Forming dense cushions on the faces and ledges of limestone cliffs on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 10–12,000 ft. June 1906." G. Forrest. Nos. 2354, 2354A.

This interesting plant has been collected before by Delavay, and in ms. named "*Gnaphalium nubigenum*, Wall., var. *likiangense*, Franch.," by Franchet, in Herb. Paris. It is quite a different plant from *G. likiangense*, Franch., as published in Journ. de Botan. x (1896), p. 410. *A. chlamydophylla*, Diels, is easily recognised by the two different modes of indumentum; the rosulate leaves of the sterile stolons being clothed with a rather woolly tomentum, the cauline leaves provided with a shining skin-like cover of densely woven hairs.

Anaphalis Franchetiana, Diels. Sp. nov.

Caulis 15–30 cm. altus, strictus, albo-tomentosus, ramosus. Rami subhorizontaliter patentes, albo-tomentelli, foliati. Folia patentia, supra glaberrima subtus albo-tomentosa, basi semi-amplectentia, lineari-oblanceolata vel -oblonga, trinervia, margine anguste revoluta, apice mucronulo saepe curvato praedita, 1·3–1·8 cm. longa, 0·2–0·25 cm. lata; costa supra insculpta. Capitula in apice ramorum terminalia, numerosa, sessilia, dense conferta, basi lanuginoso-tomentella, parva. Involucri phylla scariosa acuta, parte supera extrorsum subcurvata sed vix radiantia, exteriora ovato-lanceolata roseo-purpurascentia, interiora angustiora alba. Flores adhuc immaturi.

"Plant of 6–12 inches. Flowers white, involucral bracts rose-red. Crevices and ledges of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 12–13,000 ft. September 1906." G. Forrest. No. 2996.

Also Delavay, No. 6661, in Herb. Paris!

From the structure of the leaves this may be placed near the very variable *A. contorta* (Don) Hook. f. of the Himalayan and Khasia Hills. More material is wanted for an exact delimitation of the two species.

Leontopodium caespitosum, Diels. Sp. nov.

Stoloniferum, multiceps, inferne suffrutescens; caules floriferi 8–10 cm. longi, foliati. Folia pristina deflexa, annua basalia conferta, superiora magis remota, insigne discoloria, supra fere glabra, subtus albo-tomentosa, plana, anguste oblanceolata, apice minute mucronulata, 1–1·5 cm. longa, 2–2·5 mm. lata. Folia radiantia in utraque facie albo-tomentosa, 1·2–1·6 cm.

longa. Capitula heterogama, flores ☿ cum ♀ subaequiter mixti. Involucri phylla oblanceolata, in parte mediana subcoriacea incrassata, ceterum scariosa, dorso pilosa, apice acuta lacera ibique plerumque fuscescentia. Flores ☿ : achaenium (sterile) sublaeve ; corolla e basi tubulosa sensim dilatata 5–loba, circ. 3 mm. longa. Flores ♀ : achaenium (immaturum) papilloso-scabrum, corolla filiformi-tubulosa, circ. 3 mm. longa.

"Tufted plant of 4–6 inches. Flowers yellowish-brown. Dry, stony pastureland on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 11–12,000 ft. August–September 1906." G. Forrest. No. 4070.

In habit not unlike some forms of *L. Stracheyi*, Clarke, this species is easily distinguished from the Himalayan ally by its heterogamous flowers. It should be placed in the group *Heterogama perfecta* of Beauverd's classification (Bull. Soc. Bot. Genève, 1910, p. 245).

(1526)

Cremanthodium rhodocephalum, Diels. Sp. nov.

Caulis simplex, 7–25 cm. longus, basin versus glabratus, superne purpureo-pubescens. Folia parti inferae caulis inserta, petiolo 3–8 cm. longo anguste vaginante praedita, crasse papyracea, supra glabra, margine et subtus parce pilis paleaceis instructa, subtus et margine purpurea, e basi cordata vel excisa reniformia vel orbicularia, circumcirca late dentata vel crenatodentata, dentibus 7–15 mucronulatis ; nervi flabellati. Folia superiora spathulata vel subovata, acuminata. Capitulum seminutans. Involucri phylla exteriora anguste lanceolata, pubescentia, purpurea, 3 cm. longa, 3 mm. lata ; interiora similia, sed margine lato pallido glabro aucta, multo (ad 7 mm.) latiora. Florum ligulatorum 8–10 ligulae late oblanceolatae, apice latissimae tridentatae, 2–2·5 cm. longae, 0·8–0·9 cm. latae, cinereo-roseae, nervis purpureis ornatae ; pappus albus circ. 1 cm. longus. Florum disci corolla rosea ; tubi pars infera filiformis brevis, 2·5–3 mm. longa, supra cylindrica 8–9 mm. longa, limbi lobi breves ; antherae purpureae ; pappus albus circ. 1 cm. longus.

"Plant of 3–9 inches. Ray florets grey-pink, veined a darker shade, disc florets deep crimson-rose, faintly fragrant. In moist crevices of limestone cliffs on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. August 1906." G. Forrest. No. 2665.

This fine species is remarkably similar to the eligulate *C. campanulatum* (Franch.) Diels. ; in fact, there is a sort of mimicry between these two species, the involucral bracts of *C. campanulatum* being extremely similar in texture, shape, and colour to the ligules of *C. rhodocephalum*. The nearest species to our new

one is *C. palmatum*, Benth., of the Sikkim Himalaya, which has much deeper cut leaves (cf. Hooker Icones plant., Plate 1142), and shorter involucral bracts. In the shape of leaves, *C. rhodocephalum* is more like the yellow-flowering *C. renijorme* (DC.) Benth.

Cremanthodium Forrestii, J. F. Jeffrey. Sp. nov.

Scaposum gracile fere glabrum 20–30 cm. altum, radicibus multis fibrosis, basi reliquiis foliorum delapsorum vestitum. Folia omnia radicalia, petiolo 6–8 cm. longo praedita, sagittata lobis latis divergentibus, circ. 3 cm. longa, basi circ. 3 cm. lata, apice acuta, remote irregulariterque calloso-denticulata, palmatinervia. Scapus solitarius capitulo singulari nutante 4–5 cm. diam. terminatus. Involucri bracteae 8–12, uniseriatae, oblongo-lanceolatae, acutae, 1–1·5 cm. longae margine membranaceae fuscae. Radii flores circ. 10 ; corolla (flava ?) fere 3 cm. longa, 5–8 mm. lata, apice lobatula. Achaenia (matura non visa) glabra pappo fulvido praedita.

Tibet, Mekong-Salwin divide, north-west of Tsekou. 1904. Altitude not stated. G. Forrest. Nos. 638 and 660. Also Monbeig, without number, in Herb. Kew.

A very distinct species approaching *Senecio* (*Cremanthodium*) *Prattii*, Hemsl., in its fulvous pappus, but it is much smaller in all its parts, and at once distinguished from all other *Cremanthodia* known to me by its sagittate leaves.

Senecio pleopterus, Diels. Sp. nov.

Caulis striatus, glaber vel superne parce pilosulus, apice ramosus. Folia breviter petiolata, tenuiter herbacea vel submembranacea, superne et (paulo densius) subtus pilosula, alte pinnatifida vel pinnatipartita, pinnis utrinque 5–6, lanceolatis, conspicue serratis, apice longe acuminatis, infimis paulo brevioribus, mediis longissimis, supremis demum lobiformibus, folia (media) tota (cum petiolo) 20–25 longa, 17–18 cm. lata, nervi primarii subtus subelevati, ceteri haud prominentes. Corymbi ramos terminantes inflorescentiam amplam formantes. Capitula plerumque graciliter pedunculata, angustissima, ca 1·5 mm. lata, bracteolis 2–3 subulatis 2·5–4 mm. longis suffulta. Involucri phylla ca. 5, linearia, apicem versus subpatula, 7–8 mm. longa. Flores ☿ tubulosi ca. 3, corollae tubi pars infera fistulosa ca. 3 mm. longa, supera anguste et sensim infundibuliformi-obconica, limbo 5-dentato terminata, 4–4·5 mm. longa ; pappus albus, tubi partem inferam subaequans. Flores ♀ ca. 2–3 filiformes, corolla omnino reducta, pappo breviore praediti.

"Plant of 2–4 ft. Flowers orange-yellow. Open, grassy situations on the margins of pine forests on the eastern flank of

the Lichiang Range. Lat. 27° 15′ N. Alt. 10–11,000 ft. August 1906." G. Forrest. No. 2829.

Allied to *S. Mortoni*, Clarke, and *S. tanguticus*, Max., but different from both by the pinnate leaves and the structure of the very narrow heads.

Senecio Jeffreyanus, Diels. Sp. nov.

Folia basalia longe petiolata, petiolo superne anguste alato ad 20 cm. longo, lamina papyracea utrinque fere glabra, e basi truncata vel leviter excisa, triangulari-ovata, crenato-dentata, dentibus parvis subcartilagineis, apice breviter acuminata, 15–30 cm. longa, 12–25 cm. lata, vel major ; nervi pinnati subtus prominentes. Caulis (an semper ?) foliis nonnisi bracteiformibus late sessilibus, subintegris, acuminatis obtectus, apicem versus subarachnoideus. Racemus angustus, dense bracteatus, apice subcomosus. Bracteae flores cingentes eosque saepe superantes. Flores inferi ad. 2·5 cm. longe pedunculati, pedunculi albo-arachnoidei ; bracteolae capitulo appropinquatae angustae involucrum saepe superantes. Involucri phylla circ. 8, marginibus imbricantia, late oblonga, subobtusa, praeter apicem puberulam glabrescentia. Ligulae circ. 8 angustae, circ. 18–20 mm. longae. Florum disci corolla 7–8 mm. longa, quam pappus pallide rufidulus paulo longior.

"Sides of streams and marshy places in Hoching and Lichiang valleys. Alt. 7–8000 ft. September 1904." G. Forrest. No. 54.

This is near *S. platyglossus*, Franch., but the leaves have smaller teeth, the bracts are larger, the heads smaller.

Senecio cymatocrepis, Diels. Sp. nov.

Caulis 0·3–1 m. altus, superne pilosulus inferne glabrescens. Folia (summis exceptis) in petiolum longum breviter decurrentia, membranaceo-herbacea, supra parce strigulosa, subtus glauca glabra, ovato-oblonga vel sublanceolata, margine leviter undulato-repanda, in sinubus mucronulata, apice acuta ; media basi obtusa, summa (sessilia) acuta ; media circa 20 cm. longa, 8 mm. lata. Inflorescentia paniculata, rami paniculae inferiores compositi, ultimi thyrsoidei. Capitula subsessilia vel breviter pedunculata bracteolis nonnullis brevibus suffulta. Involucri tubuloso-cylindrici 5–6 mm. longi phylla 4 viridia sublinearia apice subpatula extus paleaceo-puberula. Flores ligulati 0, tubulosi circ. 4 aurantiaco-flavi, 7–8 mm. longi ; pappus albus fragilis.

"Plant of 1–3 ft. Flowers orange-yellow. Open, moist situations in pine woods near summit of Pien-ma pass, Irrawadi-

Salwin divide. Lat. 26° N. Alt. 10–11,000 ft. Upper Burmah. October 1903." G. Forrest. No. 848. This may be allied to *S. tetranthus* DC., of the Eastern Himalayas, but it has narrower leaves, a puberulous involucrum, and no ligules.

Senecio saluenensis, Diels. Sp. nov.

Frutex divaricatus gracilis 1·2–2·8 m. altus. Rami glabri, graciles. Folia breviter (0·6–1 cm.) petiolata; lamina papyracea, glaberrima, anguste elliptica vel oblongo-lanceolata, basi obtusa, apice acuminata, margine adpresse serrata serraturis apice mucronulatis, 10–12 cm. longa, 4·5–5 cm. lata; nervi subtus prominuli. Corymbi axillares et terminales, graciliter pedunculati, multiflori. Capitula subsessilia parva, bracteolis compluribus minutis suffulta. Involucri phylla circ. 5, lineari-lanceolata apice acuta, 3–4 mm. longa, anguste pallide-marginata. Flores ligulati 0, tubulosi circ. 3–4, viridi-lutei, 6–7 mm. longi, pappus albidus corollae tubum subaequans.

"Spreading shrub of 4–9 ft. Flowers greenish-yellow. Shady, moist side valleys of the Salwin, Salwin-Irrawadi divide, north of Lu-chang. Lat. 26° to 27° N. Alt. 4–5000 ft. N.W. Yunnan. November 1903." G. Forrest. No. 855.

Differing from *S. triligulatus*, Ham., in the bracteolate heads, fewer involucral bracts, and the absence of ligules.

Senecio scytophyllus, Diels. Sp. nov.

Caulis 30–40 cm. altus robustus, superne hinc inde arachnoideus, inferne glabrescens, basi fibris rigidis erectis ad collum radicalem cinctus. Folium basale longe (circ. 10 cm.) petiolatum, coriaceum, glabrum, lamina e basi cuneato-angustata late ovata, margine repando-dentata dentibus incrassatis, circ. 15 cm. longa, 8 cm. lata. Folia caulina minora, superiora sessilia; nervi subtus prominentes. Flores pauci, nutantes? Involucri phylla (8–10), late lanceolata vel ovata, marginem versus tenuiora quam in parte mediana, apice paulum producta, margine superiore dense albo-ciliata, ceterum glabra, 12–14 mm. longa, 4–6 mm. lata; ligulae involucri phyllis subduplo longiores flavae; pappus albus.

"Plant of 9–12 inches. Ray florets orange, disc florets greenish-orange. Shady, grassy openings in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 2964.

In habit, this approaches *Senecio arnicoides*, Wall., of the Western and Central Himalayas, but the flower is different, the involucral bracts and ligules being less numerous.

Senecio caloxanthus, Diels. Sp. nov.

Caulis inferne subflexuosus, striatus, glabrescens, ca. 0·5 m. altus. Folia (basalia non visa), caulina inferiora papyracea petiolo lato basi ± amplectente, 6–7 cm. longo praedita, in utraque facie glabra, reniformi-deltoidea, dentata, circ. 6 cm. longa, 9 cm. lata; nervi primarii palmati. Folia superiora sessilia, dentibus demum angustissimis elongatis instructa, in bracteas insignes involucra cingentes eodem modo dentato-fimbriatas transeuntia. Racemus angustus simplex, circ. 20–30 cm. longus circ. 12-florus. Capitula subremota, breviter pedunculata, erecta. Involucri phylla pauca biseriata, exteriora oblongo-linearia, interiora latiora, apice contracta puberula, ceterum glabrata, circ. 10 mm. longa. Flores radiantes. Ligulae circ. 8, late oblanceolatae, apice tridentatae, 15–17 mm. longae, 5–6 mm. latae, intense flavae. Flores tubulosi; tubi pars infera 5–6 mm. longa, superam campaniformem subaequans; limbi dentes recurvi 1–1·5 mm. longi. Pappi rufi pili rigidiusculi partem inferam tubi corollini vix attingentes, 5–6 mm. longi.

"Plant of 1–3 ft. Flowers rich yellow. Moist, open situations by sides of streams and ditches at base of the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 8500–9000 ft. July 1906." G. Forrest. No. 2546.

Sect. *Ligularia.* The species is recognised by the broadly deltoid lower cauline-leaves, the large bracts with fimbriate toothing, and the broad ligules.

Senecio oryzetorum, Diels. Sp. nov.

Annua. Caulis ± ramosus, 7–25 cm. longus, hinc inde parce villosulus, glabrescens. Folia herbacea, glabrescentia, linearioblanceolata, repando-serrata vel pinnatifida, 4–6 cm. longa, (ambitu) 0·5–2 cm. lata. Flores axillares terminalesque pedunculati pauci, breviter pedicellati, omnes tubulosi. Involucrum bracteolis minutis paucis suffultum glabrescens, subcampanulatum; phylla ad $\frac{1}{3}$–$\frac{1}{2}$ connata, lanceolato-oblonga, superne hyalino-marginata, 5–6 mm. longa, 1·5 mm. lata. Pappi pili basi coaliti nivei, nitentes, simplices, scabridi, florem aequantes. Ovarium cylindricum, 3·5 mm. longum corollam aequans. Corolla e basi dilatata anguste tubulosa, deinde in limbum 5-dentatum ampliata, lutea. Achaenium striatum brevissime pilosulum.

"Plant of 3–9 inches. Flowers yellow. Moist, open situations, bunds of padi fields, &c., in the Tali valley. Lat. 25° 40′ N. Alt. 6700–8000 ft. June–July 1906." G. Forrest. No. 4038.

Tali, Delavay, No. 812, indeterm., in Herb. Paris!

Senecio Bulleyanus, Diels. Sp. nov.

Caulis adscendens (subsimplex ?) 0·3–0·6 m. altus, basi hypophyllis parce praeditus, superius densius foliatus, glaber. Folia membranaceo-herbacea, supra parcissime puberula, subtus pallidiora, hinc inde obsolete arachnoideo-villosula, sessilia, anguste lanceolata vel lanceolato-oblonga, basin versus sensim angustata, apice acuta, margine leviter repando-dentata dentibus molliter callosis. Inflorescentia corymbosa. Flores pedicello 2–5 mm. longo instructi, omnes tubulosi. Involucrum bracteolis linearibus apice recurvatis compluribus suffultum ; phylla 6–7 subcoriacea, margine subcartilaginea antrorsum brevissime ciliolata, lineari-oblonga, apice intensius colorato acuta, 4–5 mm. longa, circ. 1·5 mm. lata. Pappi pili simplices scabridi ca. 5 mm. longi. Corolla flava ; tubi pars infera 2·5 mm. longa, supera elongato-campanulata, 4·5 mm. longa ; limbi lobi reflexi. Ovarium 1·5 mm. longum, scabrum, breviter cylindricum.

" Plant of 1–2 ft. Flowers orange-yellow. Grassy openings in pine forests amongst scrub on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. August–September 1906." G. Forrest. No. 4053.

The heads are very similar to those of *Gynura*, but the style is *Senecio*-like.

Senecio yakoensis, J. F. Jeffrey. Sp. nov.

Caulis suffruticosus erectus 90–180 cm. altus, rufescens, dense araneoso-lanato-villosus. Folia oblongo-lanceolata, 7–13 cm. longa, 4–5 cm. lata, petiolo circ. 1 cm. longo praedita, acuminata, basi subrotundata vel cuneata, setaceo-serrulata, supra pubescenti-setulosa, subtus dense albido-floccoso-tomentosa et in nervis rufo-villosa. Inflorescentiae dense corymbosae, axillares et ramulos terminantes, albido-tomentosae. Capitula 1 cm. longa vel ultra, 6–7 mm. diamet., bracteis bracteolisque multis lanceolatis vel linearibus praedita. Phyllaria 9–13 oblonga, acutiuscula, albido-tomentoso-villosa, apice rufo-purpurea. Flores in capitulo 4–5 ligulati, vix involucro longiores, tubulosi 7–9 ; antherae breviter caudatae. Achaenia (matura non visa) 2–3 mm. longa striata, glabra, pappo albido praedita.

" Erect plant of 3–6 ft. Flowers orange, fragrant. Damp, shady situations of the Salwin, Salwin-Irrawadi divide, only in one place on Yāko ridge, near the village of Yāko. Lat. 26° 30′ N. Alt. 7–8000 ft. N.W. Yunnan, November 1905." G. Forrest. No. 959.

This handsome species is very closely allied to *S. Bhot*, Clarke, from which it differs in not having the markedly angular stems and in its dense indumentum. The phyllaries on the whole

are more carinate, less margined, and distinctly villous, while the capitula contain less than half as many florets.

Cnicus taliensis, J. F. Jeffrey. Sp. nov.

Caulis 60–100 cm. altus, striato-sulcatus, dense setulosus. Folia supra strigillosa subtus villoso-setulosa, lanceolata, pinnatifida, basi attenuata, dentibus lobisque spinescentibus praedita, caulina superiora semi-amplectentia, 5–6 cm. longa, inferiora sub-petiolata 15 cm. longa. Capitula solitaria vel 2–3 racemose ad apicem ramulorum disposita, sub-cernua, subrotunda, 4–5 cm. lata. Phyllaria araneoso-albido-villosa linearia, omnia aequalia, circ. 2 cm. longa exteriora et media spinulis simplicibus pectinato-spinulosa; phyllaria intima mollia mutica. Flores atropurpureae; corolla 2–2·5 cm. longa; pappus sordide albidus, pilis plumosis apice paullo clavellatis compositus; achaenia 3 mm. longa, compressa, ellipsoidea, glabra, brunnea.

"Common round Tali and the valleys north of Tali Lake. Elevation from 6700–9000 ft. Plant of 2–3½ ft. Flowers deep purple, almost maroon. Yunnan, October 1904." G. Forrest. No. 10. Also Yunnansen, Maire, No. 1289.

This species approaches *C. Henryi*, Franch., in the pectinate phyllaries, but the florets of *C. taliensis* are twice as long, and the leaves scabrid and much more spinous.

45273 **Cnicus Forrestii,** Diels. Sp. nov.

Caulis 15–30 cm. altus, superne brunneo-arachnoideus, simplex, dense foliatus. Folia subamplectentia, media 12–14 cm. longa, supra pilosula, subtus praeter nervos pilosos glabra, nervis apice longissime pallidis spinescentibus horridis atque margine spinis parvis praedita, ambitu ovata, alte pinnatisecta, segmentis utrinque 5–8 subtriangularibus, basi lata saepe lobis 1–2 triangularibus auctis. Capitula 3–8, apice caulis conferta, sessilia, circ. 2 cm. diamet. Involucri phylla circ. 5-seriata; exteriora lanceolata, margine et apice spinosa, interiora mollia, vix pungentia, linearia, acuta, apice haud dilatata purpurascentia. Pappi pili brunnei, circ. 12 mm. longi; corolla kermesino-purpurea, tubi pars infera angustissima, 5–6 mm. longa, pars supera cylindrica, circ. 5 mm. longa, limbi lobi angusti 3–4 mm. longi. Antherae albae.

"Plant of 6–12 inches. Flowers corollas crimson-purple, anthers white, giving the head a ruddy grey appearance. Very boggy ground on the plain at the north end of the Lichiang valley. Lat. 27° 10′ N. Alt. 10,000 ft. June 1906." G. Forrest. No. 2373.

Apparently allied to *C. argyracanthus* DC., but differing in the foliage and the soft inner involucral leaves.

Another allied species is *C. Cerberus*, Vaniot (of Kwei chou), but this has the leaves less widened at the base, with less pungent, much shorter teeth, and the upper part of the stem nearly free from leaves.

Saussurea gossypiphora, Don. Prodr. Nep., p. 168, non Franchet, in Journ. de Bot. ii (1888), 359.

"Plant of 6–12 inches. Flowers dark crimson. Sheltered situations amongst boulders on barren, wind-swept ridges on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 16,500–17,000 ft. August 1906." G. Forrest. No. 3006.

"This was the extreme limit of vegetation, and was situated higher than No. 3005, which again was higher than any other species. Close to limit of perpetual snow."

It was apparently not collected by Delavay, no Yunnan specimen being present in the Paris Herbarium. The plant named so by Franchet is the following *S. leucoma*, Diels.

This plant is very similar to some Sikkim forms in its entire leaves, but the teeth of the leaves are more obtuse. The hairs of the inner involucral bracts and the pappus are blackish.

The outer involucral bracts are soft, densely clothed with white wool, about 2·5 cm. long, 0·2 cm. broad, the inner ones smaller, but also very narrow, coriaceous, about 1·3 cm. long, 0·15 cm. broad, with long linear tips. The corolla tube has a slender lower part of 0·25 cm., the upper part is cylindrical, 0·6 cm. long, the segments of the limb 0·15 mm. long. The pappus is uniseriate.

Saussurea leucoma, Diels. Sp. nov.

S. gossypiphora, Franch., in Journ. de Bot. ii (1888), 359 non Don.

Caudex crassus, saepe repens vel procumbens. Caulis 7–15 cm. longus, densissime foliatus. Folia basi arachnoideo-lanuginosa, antrorsum glabrata, patentia vel superiora deflexa, alte pinnatifida, segmentis falcatis late linearibus obtusis, inferiora 5–6 cm. longa, 1·5–1·8 cm. lata, superiora reducta, summa fere integra. Capitula numerosa e foliis exserta. Involucri phylla extima linearia, acuta, dense lanuginosa, circ. 1·5 cm. longa, 0·2 cm. lata, interiora praeter partem mediam subcoriaceam hyalino-scariosa, non nisi apice ipso pilis albis lanuginosis praedita, circ. 0·9–1·1 cm. longa, 0·4 cm. lata. Corolla saturate coeruleo-purpurascens; tubi pars infera angusta 0·5–0·6 cm. longa, supera 0·35 cm. longa; limbi segmenta 0·25 cm. longa.

"Plant of 3–6 inches. Flowers deep bluish-crimson. Sheltered situations amongst boulders on barren wind-swept ridges on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 16–16,500 ft. August 1906." G. Forrest. No. 3005.

It was collected before in the Lichiang Range, " in limestone rocks not far below the limit of perpetual snow, in alt. 16,000 ft.," by Delavay (No. 2452, in herb. Paris).

This form of the *Eriocoryne*-Section is different from any of the Himalayan ones which I have seen in the Kew Herbarium. It is easily distinguished from the *S. gossypiphora*, growing in the same range, by its habit, as well as the numerous differences in the structure of the involucral bracts and corollas.

Saussurea euodonta, Diels. Sp. nov.

Caulis 0·3–0·6 m. altus, superne pubescens, basin versus glabratus, costatus. Folia infima tempore florendi evanida, media haud decurrentia, petiolo 2–3 cm. longo ± piloso praedita; lamina tenuiter herbacea ad nervos parce pilosa vel omnino glabra, subtus pallidior, e basi truncata vel cuneato-acuta late ovata, dentata dentibus mucronatis, apice longe acuminata, 7–10 cm. longa, 5–6·5 cm. lata. Capitula pauca (circ. 3) in axillis foliorum summorum solitaria et terminalia; pedunculus sub capitulo incrassatus; involucri phylla basi subcoriacea, ceterum foliacea, saepe purpurascentia, apice acuta nonnunquam patula vel reflexa, infima ovata, intima angustiora, extus ± pilosula. Flores purpurei. Corollae limbi segmenta angusta, ovarium glabrum. Pappi series exterior rudimentaria setis perbrevibus; seriei interioris pili basi coaliti plumosi circ. 11 mm. longi, corollae tubum latum aequantes.

" Plant of 1–2 ft. Flowers deep purplish crimson. Dry, shady situations in and on the margins of pine forests on the eastern flank of the Lichiang Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. August 1906." G. Forrest. No. 4023.

" Plant of 1–2 ft. Flowers reddish-purple. Grassy openings in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10–11,000 ft. August 1906." G. Forrest. No. 2823.

In habit, this species is similar to *S. oligantha*, Franch., of North-east Szechuan, the leaves of which are ovato-cordate, with the basal lobes being produced, and which has the outer row of the pappus nearly half as long as the inner one.

A closely allied species is *S. Cavaleriei*, Lév. et Van. (of Kuei chou), but the leaves of that species are less cuneate towards the base, the teeth are more numerous and smaller, the heads more numerous, and the outer pappus completely wanting.

Saussurea Forrestii, Diels. Sp. nov.

Caulis elatus, 50–60 cm. altus, rufus, apicem versus pubescens, superne ramosus. Folia brevissime petiolata vel subsessilia, inferiora nonnunquam subamplectentia, herbacea, supra glabra

subtus pallide cinereo-pannosa, lanceolata, minute repando-denticulata denticulis mucronulatis, apice acuta (inferiora et media), 15–18 cm. longa, 4·5–5·5 cm. lata; nervi subtus rufiduli, nervuli supra paulum insculpti. Folia summa capitulo appropinquata patentia. Capitula ad apicem ramorum solitaria. Involucri phylla laxius imbricata, subcoriacea, lutescentia, margine foliacea herbacea ibique sublacera, exteriora late ovata circ. 0·6 cm. longa, interiora spathulato-linearia ad 1·5 cm. longa. Corolla purpureo-rosea; tubi circ. 1·2 cm. longi pars supera (4 mm. longa) anguste patelliformis, limbi lobi angusti, circ. 2·5 mm. longi; ovarium glabrum. Pappi pili plumosi subaequales uniseriati.

"Plant of 20–24 inches. Flowers purplish-rose. Shady, grassy openings in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10–11,000 ft. September 1904." G. Forrest. No. 2940.

This species is not very like any of the Yunnan *Saussureae* known to me; it is easily recognised by its foliage and involucre.

Jurinea edulis, Franch., f. **caulescens,** Franch., in Journ. de Bot. vii (1894), 22. *Saussurea edulis*, Franch., in Journ. de Bot. ii (1888), 337 pro parte.

Caulis ad 30 cm. altus apicem versus foliosus, glabratus. Folia breviter petiolata, ambitu late ovata, herbacea, ad 12 cm. longa, profunde inciso-lobata subpinnatifida lobis dentatis; saepe tenuiora, pallidiora, capitulum amplum obvallantia, suprema in involucri phylla (exteriora 3 cm. longa, 1·2 cm. lata), purpurascentia apice ciliata mucronulata transeuntia. Capitulum solitarium, 5 cm. longum, 6 cm. latum, flores saturate purpureo-kermesini.

"Plant of 9–18 inches. Flowers deep purple-crimson. Open mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 3002.

Jurinea berardioidea, Franch. (sub tit. var.). *Jurinea edulis* *β berardioidea*, Franch., in Journ. de Bot. viii (1894), 22. *Saussurea edulis*, Franch., in Journ. de Bot. ii (1888), 337 pro parte.

Caulis brevis, 3–8 cm. altus, foliatus, pubescens. Folia longius petiolata, lamina crassius herbaceo-papyracea, magis pilosa, late-elliptica vel fere suborbiculata, leviter crenata vel repando-lobata, suprema demum fere sessilia. Capitulum solitarium 5 cm. longum, 4·5 cm. latum. Involucri phylla crassa, vix purpurascentia, latissime ovata, exteriora 2·5 cm. longa, 1·8 cm. lata.

"Plant of 1 inch. Flowers pale purple. Open, barren

situations on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 10,500 ft. June 1906. N.W. Yunnan." G. Forrest. No. 2481.

Jurinea Forrestii, Diels. Sp. nov.

Caulis 2·5–5 cm. longus. Folia rosulata, humifusa; inferiorum petiolus 4–6 cm. longus fusco-pilosus, lamina firme herbacea, utrinque strigillosa-pilosa, basi truncata vel retusa, latissime ovata vel elliptica, dentato-lobata, lobis nonnunquam iterum dentatis, 8–10 cm. longa, 8–9 cm. lata, nervi utrinque circ. 8–10 adscendentes. Folia superiora mox reducta, glabrescentia, pallida inflorescentiam obvallantia. Capitula subsessilia, pluria, ovata, 3·5–4 cm. longa, 2–2·5 cm. lata. Involucri phylla extima ovata, interiora lanceolata, glabra, purpureo-suffusa et marginata, haud pungentia. Flores purpurei, eis priorum similes.

"Plant of 1–2 inches. Flowers reddish-purple. Grassy openings in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. August 1906." G. Forrest. No. 2806.

This species is similar in foliage to *J. berardioidea*, but differing from it by the pale inner leaves surrounding the inflorescence. It differs from both *J. edulis* and *J. berardioidea* by having several (*e.g.* 3) heads. From *J. Soulici*, Franch., of Tongolo, it is distinguished by the broader leaves and soft involucrous phylla.

Pertya phylicoides, J. F. Jeffrey. Sp. nov.

Species ramis virgatis, foliis minutis, habituque ipso distinguitur.

Frutex rigidus, 90 cm. alt. Ramuli rigidi virgati rufo-pubescentes. Folia 3–4 mm. longa, fasciculata, ovata, apiculata, revoluta, sessilia, supra glabra subtus albo-sericea, pulvinis sericeis inserta. Capitula 4–5–flora solitaria in axillis foliiferis, sessilia, 1·5 cm. longa. Phyllaria circ. 1 cm. longa, glabrata, membranacea marginibus pilosis, exteriora minora ovata acuta, interiora oblongo-lanceolata acuta. Corolla alte 5–fida, segmenta angusta acuminata. Antherae basi longe caudatae. Achaenia circ. 5 mm. longa, utrinque leviter angustata, compressiuscula, longitudinaliter costata, pilis albescentibus erectis sericea. Pappi setae simplices, rigidiusculae fulvae achaeniis longiores.

"Dry limestone country on the descent from Chung Tien plateau to Yangtse, near Chiao Tou. Elevation, 10,000 ft. Yunnan, September 1904." G. Forrest. No. 112.

This is very distinct from any species in Herb. Kew (or Paris—Diels), and I am indebted to J. F. Duthie, Esq., for the deter-

mination of the genus. The minute fascicled leaves inserted on silky pulvini remind one of some species of *Phylica*.

[Its closest ally is *P. Bodinieri*, Beauverd, collected near Yunnanfu by both Ducloux and Bodinier (in herb. Paris).—Diels.]

Lactuca Beesiana, Diels. Sp. nov.

Caulis circ. 75 cm. altus, inferne glaber, superne puberulus, subsimplex. Folia inferiora tempore florendi evanida, media petiolo 2–3 cm. longo haud alato praedita, supra strigilloso-pilosula, subtus glabriora, alte pinnatipartita (cum petiolo), 9–10 cm. longa, 5–6 cm. lata; segmenta utrinque 2–3 obscure rhombeo-elliptica, levissime repanda denticulisque minutis mucronulatis ornata. Folia superiora mox integra, linearilanceolata; summa bracteiformia. Flores inferi cymam paucifloram axillarem formantes, superiores solitarii, pedunculati. Involucri phylla pauciseriata, herbacea, purpurascentia, parce strigoso-pilosa; exteriora lanceolata, interioribus 1–1·2 cm. longis linearibus subdimidio breviora. Achaenia complanata, apice rostrata, circ. 6 mm. longa; pappus albus fragillimus.

"Plant of 1½ to 2 ft. Flowers pale blue. Grassy ledges of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 10–11,000 ft. October 1906. N.W. Yunnan." G. Forrest. No. 3081.

Allied to *L. Henryi*, Dunn (Henry No. 13494, of Southern Yunnan); but the leaf-blade of *L. Beesiana* is not decurrent into the petiole, the leaves are smaller and not scabrous, the segments not obtuse triangular but of a more rhombical form.

Crepis rosularis, Diels. Sp. nov.

Caulis 2–6 cm. longus, inferne glabratus squamis membranaceis anguste lanceolatis linearibusve, superne foliis inflorescentiam rosulato-cingentibus obtectus. Folia longe petiolata vel suprema demum subsessilia; lamina tenuiter membranacea praecipue ad marginem floccoso-pilosa pilis brunneis, obovata vel subspathulata, obtusa, integra, uninervis, 1·2–2 cm. longa, 1–1·3 cm. lata. Capitula breviter pedunculata vel subsessilia arcte conferta; bracteolae lineares ciliato-pilosae; involucri phylla circ. 5 subaequalia, lineari-oblonga, viridia, fere glabra, vix marginata subobtusa. Flores intense lutei, fragrantes; ligulae alte dentatae. Achaenia (perfecta non visa) immatura compressa, pappus rufescens, fragilis, involucrum superans.

"Plant of 1–2 inches. Flowers bright canary yellow, fragrant. Open situations on limestone drift at base of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. July 1906." G. Forrest. No. 2776.

Belongs to the *Glomeratae*, Hook. f., and seems to be nearest

to *C. glomerata* (Decne.) Hook. f. (Kashmir), but the leaves are obovate, the involucral bracts have not a white edge and are nearly glabrous. The ripe achaenia are unknown, but, in the young state, they seem different from those of *C. glomerata.* For the whole affinity compare Franchet, in Journ. de Bot. ix (1895), 255.

4528b **Crepis rigescens,** Diels. Sp. nov.

Caules saepe plures, superne ramis virgatis praediti, 20–40 cm. longi, stricti, glabri, subangulati, subrigidi. Folia pauca, basalia petiolata, caulina subsessilia, anguste lineari-lanceolata, utrinque sensim angustata, 5–8 cm. longa, 2–8 mm. lata, glabra, margine ± revoluta. Corymbi rami subcurvati, rigidiusculi, bracteolis minutis subulatis praediti. Involucrum phyllis bracteoliformibus paucis auctum; phylla 8–12, lineari-lanceolata, basin versus parce et minute lanuginosa, marginibus pallidiora, ca. 8 mm. longa, 1 mm. lata. Flores aurantiaco-flavi, 1·3–1·5 cm. longa. Pappi pili nivei 5–6 mm. longi. Ovarium glabrum ambitu ovato-oblongum apice attenuatum.

"Plant of 9–18 inches. Flowers orange-yellow. Open, dry situations amongst oak and pine scrub on plain at north end of Lichiang valley. Lat. 27° 10′ N. Alt. 9000 ft. May 1906." G. Forrest. No. 2192.

"Plant of 10–16 inches. Flowers yellow. Dry, open situations in pine scrub on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. July–August 1906. W. Yunnan." G. Forrest. No. 4050.

Allied to *C. chloroclada,* Coll. et Hemsl., of the Shan hills, but differing in the more glabrous involucra and more numerous flowers of the heads. I have not seen the ripe achenes. Possibly our species is only a form of the Shan plant.

4528 **Crepis paleacea,** Diels. Sp. nov.

Perennis. Caulis glabratus, basi simplex, 50–60 cm. longus. Folia basalia petiolo lato subalato 4–5 cm. longo praedita, lamina herbacea, subtus pilis paleiformibus pallide rufis subfloccosa, ambitu late oblanceolata, uncinato-pinnatifida lobis patentibus triangularibus, 6–8 cm. longa, 3–3·5 cm. lata. Folia caulina mox subintegra, lanceolato-linearia. Inflorescentiae rami apice pauciflori; pedunculi pedicellique sub capitulis parce lanuginosi. Involucri phylla basalia minuta, ovata vel lanceolata, brevia, interiora ca. 12 mm. longa, viridia, linearia. Pappi pili albi, 6 mm. longi, simplices. Stamina 10–12 mm. longa. Corolla flava 12–14 cm. longa, apice 5-dentata.

"Plant of 1–2 ft. Flowers orange. Open, grassy situations on the margins of pine forests on the eastern flank of the Lichiang

Range. Lat. 27° 20′ N. Alt. 9–11,000 ft. August 1906. N.W. Yunnan." G. Forrest. No. 2708.

The foliage is very like that of *C. fuscipappa*, Benth., but our plant is perennial, the inflorescence is quite glabrous and the pappus white.

Prenanthes yakoensis, J. F. Jeffrey. Sp. nov.

Species affinis *P. scandenti,* Hook. f. et Thoms. sed laminis foliorum basi profunde excavatis, capitulis majoribus et paucioribus distinguenda.

Caulis semi-scandens glabratus, ramulis crebris flexuosis. Folia cordato-ovata vel ovato-sagittata, acuminata, obsolete crenata, denticulis setaceis remotis praedita; lamina basi profunde in sinum subrotundatum excavata, 5–15 cm. longa, 2–6 cm. lata, supra sparse puberula, infra paulo densius praesertim in nervis, infra glaucescentia et venulis pulchre reticulatis conspicua ; petiolus pubescens vel in maturitate glaber, 3–5 cm. longus, infra glaucescens. Capitula 6–7 aggregata in paniculis laxis axillaribus terminalibusque circ. 1 cm. longa, 5 mm. lata, 10–12–flora. Pedunculi circ. 1 cm. longi, fere rectangulo patentes, bracteis minutis subulatis praediti. Phyllaria interiora 6–8 lanceolata obtusiuscula, exteriora parva hirsuta. Corolla externe ad medium pilosa. Achaenium 4 mm. longum, compressum, striatum. Pappus subuniserialis, albidus.

" Half-scandent plant of 8–12 ft. Flowers crimson. Amongst scrub in shady situations, edges of pine woods, etc., Salwin valley, Salwin-Irrawadi divide. Only in one place, viz. :—Summit of the Yako ridge. Lat. 26° 30′ N. Alt. 9000 ft. N.W. Yunnan, November 1905." G. Forrest. No. 870.

CONVOLVULACEAE.

Ipomaea caloxantha, Diels. Sp. nov.

Planta repens, 0·9–3·2 m. longa. Folia (superiora) ad insertionem petioli ca. 2 mm. longi pilosa, ceterum fere glabra, e basi cordata subtriloba (lobis basalibus brevibus obsolete undulatis, lobo terminali longiore, lanceolato, acuto), 3–3·5 cm. longa (basi), 2–2·5 cm. lata. Cymae 3–5–florae, longe pedunculatae ; pedunculus 2·5–4·5 cm. longus, pedicelli 0·6–1·3 cm. longi, bracteolis 2 minutis praediti. Sepala coriacea, marginata, glabra ; exteriora majora, obovata, 6–8 mm. longa. Corolla intense lutea, 3–4 cm. longa. Ovarium 2–loculare 4–ovulatum.

" Creeping plant of 3–10 ft. Flowers bright yellow. On dry, exposed, rocky situations. Valley of the Mekong at the crossing of the Teng-Yueh-Talifu road. Lat. 25° 18′ N. Alt. 4200 ft. W. Yunnan, September 1903." G. Forrest. No. 1111.

Allied to *I. polyantha*, Miq. var. *affinis*, C.B. Clarke (*Convolvulus affinis*, Wall.), of Burmah, but the leaves are narrower, the flowers larger, the calyx glabrous.

CRUCIFERAE.

Thlaspi yunnanense, Franch., var. **dentata,** Diels. Var. nov.

Folia quam ea typi latiora, dentata, ad 15 mm. longa, 12 mm. lata.

"Plant of 3–6 inches. Flowers white, pale slate-blue on exterior of petals. In crevices of limestone cliffs on the eastern flank of the Lichiang Range. Lat. 27° 12′. Alt. 12–13,000 ft. Flow. May 1906." G. Forrest. No. 2130.

Cardamine (Dentaria) repens, Franch.

Dentaria repens, Franch., in Bull. Soc. Bot. France, vol. xxxii, 6.

? *Cardamine tenuifolia*, Turcz. var. *repens*, Franch. Plant. Delavay., 55.

Staminum filamenta vix dilatata non papillosa. Sepala minus concava.

"Plant of 6–18 inches. Flowers white. Dry, stony situations on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–8000 ft. May–June 1906." G. Forrest. No. 4327.

Cardamine (Dentaria) granulifera (Franch.), Diels.

? *Cardamine tenuifolia*, Turcz., var. *granulifera*, Franch. Plant. Delavay., 56.

Rhizoma repens hypophyllis carnosissimis et radicibus e tuberculis ortis dense obsitum. Caulis erectus 10–30 cm. altus. Folium basale longe petiolatum (an semper ?), integrum, late cordatum vel reniforme. Folia caulina 3–no– vel 5–no– pinnatifida, segmenta oblanceolata vel linearia interdum tenuissima. Racemi conferti pauciflori. Sepala valde concava, subcymbiformia, 3–3·5 mm. longa, circ. 2 mm. lata. Petala obovata, nonnunquam emarginata, alba, coerulea vel pallide purpurascentia, 6–7 mm. longa, 4–5 mm. lata. Stamina valde dilatata, papillosa, 4–5 mm. longa, circa 1 mm. lata, sub ipsa anthera subito tenuissime attenuata.

"Plant of 4–8 inches. Flowers white or rose-lavender. Mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 12′. Alt. 9–11,500 ft. Flow. May 1906." G. Forrest. Nos. 2140, 2189.

"Plant of 6–12 inches. Flowers white or pale mauve. Mossy, shady situations in dense pine forests on the eastern flank of the

Lichiang Range. Lat. 27° 12′ N. Alt. 10–10,500 ft. Flow. June." G. Forrest. No. 2258.

"Plant of 6–12 inches. Flowers white or pale rose. Dry, shady, rocky situations in pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. Flow. June–July 1906." G. Forrest. Nos. 4335, 4335*a*.

Cardamine Franchetiana, Diels. Nom. nov.

Loxostemon Delavayi, Franch., in Bull. Soc. Bot. France, xxxiii, 400; in Plant. Delavay., 56.

"Parmi les pierres après la fonte des neiges au Glacier de Likiang, 9 juillet 1884." Delavay, No. 35, in Herb. Paris.

"Plant of 6–10 inches. Flowers white. Open situations on limestone drift on eastern flank of the Lichiang Range. Lat. 27° 12′. Alt. 11–12,000 ft. June 1906." G. Forrest. No. 2225.

This agrees with Franchet's description, but the flowers are white. Basal leaves are wanting in Forrest's specimen.

It is very near the Himalaya *Loxostemon pulchellus,* Hook. f. et Thoms., of Sikkim, which should be placed with *Cardamine.* It differs chiefly by the plurijugous leaves, but it remains to settle if this character is constant.

The three preceding species are closely allied, and may prove to be connected by numerous intermediate stages. They are very interesting, uniting, as they do, the rhizome of *Dentaria* with the foliage and habit of *Eu-cardamine.*

Solms-Laubachia, Muschler. Gen. nov.

Flores magni vel maximi, hermaphroditi. Sepala ovato-lanceolata vel lineari-lanceolata, basi aequalia, leviter convexiuscula, basi subsaccata, albo- vel rubello-marginata, pilosiuscula, persistentia. Petala magna, calyce duplo longiora, distincte unguiculata, turcosa. Stamina quoad numerum et positionem varia $2+(2+2)$ vel $2+2$ vel $0+2$; antherae quadriloculares, defloratae saepe recurvatae; filamenta interdum brevia et basi incrassata. Glandulae 4–8, a numero et positione staminum dependentes, tuberculiformes usque filiformi-elongatae; medianae lateralibus fere semper minores et plerumque inter, raro intra vel extra filamentorum geminatorum bases sitae, rarissime nullae. Siliculae immaturae, ut videtur ovato-oblongae, teretes vel compressiusculae valvis convexis, septum ovato-oblongum; stylus satis elongatus usque subnullus, stigmate saepe distincto capitato, plerumque circumcirce aequali vel supra repla magis aucto. Semina 2–3-seriata, ut videtur 5–8, immarginata; funiculis setaceis liberis. Plantae perennes, suffruticosae. Radix

crassa, saepe superne ramosa et inde multiceps, apice rudimentis foliorum delapsorum dense vel densissime vestita et in rosulam foliorum basilarium desinens. Scapi plerumque nudi vel rarius pilis minimis unicellularibus albidis subdense obtecti, uniflori, foliis longiores. Folia tenuia, modo membranacea, linearilanceolata vel oblongo-lanceolata, integerrima, basin versus sensim in petiolum plus minus longum attenuata, plerumque glabra vel interdum pilis eis caulis similibus pilosa.

Genus novum valde affinis *Brayae* est, sed primo visu differt floribus turcoso-coeruleis magnis, calyce persistente, sepalis convexiusculis ac glandulis maioribus.

Solms-Laubachia pulcherrima, Muschler. Sp. nov.

Rhizoma tortuosum, 12–15 cm. longum, cortice cinereo, crassiusculo, dense reticulato-rimuloso vestitum, apice plerumque ramosum ; ramis brevissimis, apice foliosis, dense congestis, obscure dichotomis. Folia omnia isomorpha imbricata ramo adpressa, saepius antrorsum leviter curvula, infera vetusta et emortua cinerea, supera vel apicalia virescentia, subcrassiuscula, rigidula, ovata vel ovato-lanceolata, 2–3 cm. longa, 0·75–1 cm. lata, pilis satis longis unicellularibus simplicibus sericeis albidis plus minus dense obtecta, dein mox subglabra. Flores maximi, solitarii, longissime pedunculati (pedunculis usque ad 6–7 cm. longis, pilis eis foliorum similibus densissime obtectis) ; sepala ovato-lanceolata vel lineari-lanceolata, basi aequalia, albomarginata, pilis minimis unicellularibus simplicibus flavido-albis dense vel densissime vestita ; petala, etc., cf. diagn. generis.

" Plant of 2–4 inches. Flowers bright turquoise blue, fragrant, aromatic. Growing in crevices of limestone cliffs on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 12,000 ft. Flow. bright turquoise blue, May 1906." G. Forrest. No. 2164.

Allied to *Braya,* but differing in its short, one-flowered scapes, small sepals, and turquoise-coloured petals. It is dedicated to Professor Graf zu Solms-Laubach.

[In habit our plant is not unlike to *Parrya exscapa,* Mey., of the Altai Mountains and Western Tibet, but easily distinguished from it by the hairiness of leaves and peduncles, the entire leaves, the sub-equal sepals, and the colour of the larger flowers. L. Diels.]

CUCURBITACEAE.

Hemsleya amabilis, Diels. Sp. nov.

Planta scandens ad 0·9-2·7 m., glabra. Folia petiolo ca. 3 cm. longo praedita, pedato–7—8–partita, (sub lente) ciliolata

ceterum glabra; foliola anguste lanceolata, basi petiolulato-attenuata, crenato-serrata serraturis mucronulatis, apice acuminata acuta, 6–8 cm. longa, 1·5–1·7 cm. lata. Folia suprema reducta. Panicula ♂ gracilis; rhachis ramulique flexuosa, ad 15 cm. longa. Flores pedicellati, bractea minuta suffulti. Calyx fere ad basin partitus, sepala anguste ovata 4–5 mm. longa, 2–2·5 mm. lata, petala rotato-expansa, viridulo-lutea, obovato-obcordata, 4·5–6 mm. longa, 4–5 mm. lata. Stamina 1·5–2·5 mm. lata.

"Scandent plant of 3–9 ft. Flowers greenish-yellow. Open situations on scrub on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. June 1906." G. Forrest. No. 4755.

"Scandent plant of 4–8 ft. Shady situations on scrub on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–8000 ft. May–June 1906." G. Forrest. No. 4772.

Also Yunnanfu, Ducloux. No. 496.

This plant is similar to *Hemsleya chinensis*, Cogn. (Hooker's Icon. Plant., 1822), in foliage and the structure of the ♂ flowers, which, however, are much more numerous and smaller in the new species. I have not seen the ♀ plant.

DIAPENSIACEAE.

Diapensia Bulleyana, Forrest, ms., in schedis. Sp. nov.

Fruticulus nanus pulvinaris ramosissimus, 5–10 cm. altus. Rami plerumque dense conferti, rarius laxiores elongati, procumbentes. Folia basi imbricata longius vaginata; vagina dilatata 3–5 mm. longa; lamina saepe recurva, crassa supra sicca rugulosa lucida papillosa, subtus pallidior sublaevis, spathulata vel elongato-obovata, 5–8 mm. longa, 3–3·5 mm. lata; nervi supra immersi subtus obsoleti. Flores terminales singuli sessiles. Sepala subcoriacea, obovata, costata, apice apiculata, 5–6 mm. longa, 3 mm. lata. Corolla lutea carnosula; tubus 8 mm. longus, lobi suborbiculares apice subtruncati, 5–6 mm. diamet. Staminum 5 filamenta lata, margine inflexa, basi lobo sive plica ornata, 2·5 mm. longa, 1·5 mm. lata. Staminodia epipetala 5 tubo fere medio inserta, subconica vel clavata, saepe fere falcata. Stylus 12 mm. longus.

"Dwarf shrub of 2–4 inches. Flowers canary yellow. Exposed situations on ledges of cliffs and humus-covered boulders on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 11–12,000 ft. Flow. September 1906." G. Forrest. No. 1853.

This interesting little plant is exceptional in the genus by the presence of five staminodia opposite the petals; also the yellow

flowers are noteworthy. It is separated from *D. lapponica*, moreover, by the broad filaments with basal lobes. From *D. himalaica*, Hook. f. et Thoms., it is further distinguished by a stouter habit, thicker leaves, larger flowers, and a more fleshy corolla.

DIPSACACEAE.

Morina chlorantha, Diels. Sp. nov.

Rhizoma crassum, collo vestigiis petiolorum pristinorum atrofuscis fibrosis cinctum. Caules 0·3–0·6 m. longi, inferne sparse subtus densius pilosi. Folia basalia membranaceo-herbacea, glaberrima, subtus pallida, inferiora oblanceolata in petiolum sensim angustata, repando-dentata, breviter spinulosa, 15–25 cm. longa, 2–3 cm. lata. Folia superiora verticillata, basi longius spinosa. Bracteae basi dilatata pallidae ibique pungenti-spinosae, flores fere includentes. Involucellum parte infera subscariosa pallidum, limbum versus viride, circ. 15–spinosum, 8–10 mm. longum. Calyx circ. 10–12 mm. longus, subcoriaceus, puberulus; tubus brevis 3–4 mm. longus, 4–5 mm. latus, 4–lobatus; lobi bini 9 mm. longi altius (fere ad dimidium) connati, ovati, apiculati. Corolla parce puberula, viridis, foetida (an cleistogama?), in specimine nostro calyce occulta, 7 mm. longa, 2–2·5 mm. lata, lobi rotundati, denticulati. Stamina 2 fertilia, filamentosa, faucem attingentia, 2 sterilia reducta, ad basin tubi sessilia.

"Plant of 1–2 ft. Flowers green, with a very rank odour. Moist, shady ledges of cliffs in side valleys on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 10–11,000 ft. June 1906." G. Forrest. No. 2482.

This remarkable plant is allied to *M. parviflora*, Kar. et Kir. var. *chinensis*, Batal. (which ought to be considered as a distinct species), but is different by the longer petioles of the basal leaves, the more regular toothing of the leaves, the calyx-lobes being separated by much deeper sinuses and apiculate, not obtuse.

It has not been collected by Delavay.

Morina Bulleyana, G. Forrest et Diels. Sp. nov.

Caulis 30–40 cm. altus, pilis in seriebus longitudinalibus dispositis vestitus. Folia herbacea, glabra, caulium sterilium linearia, patenti-spinosa, 12–15 cm. longa 1–1·5 cm. lata, caulium florentium infima squamiformia, superiora basi connata, lanceolata vel ovato-lanceolata, subtus pallida, (media) 5 cm. longa, 1·5–2 cm. lata. Inflorescentia subcapitata, bracteata; bracteae intensius spinosae, spinis stramineis. Involucelli tubus 4–4·5 mm. longus, spinae circ. 15 molles, vix pungentes, 4 mm. longi.

Calyx 12–15 mm. longus, integer, spathaceus, ore obliquo spinosus atque pilosus. Corolla extus pilosa, alba vel purpurea ; tubus curvatus, 20–25 mm. longus, limbi lobi late ovati, apice emarginato-bilobi, 5 mm. longi. Stamina fertilia 4.

" Dry, grassy hillsides. Chung Tien plateau. Alt. 12–13,000 ft. 1904." G. Forrest. No. 393.

Mountains near Tali. Delavay, No. 90, etc., " *M. betonicoides*, Benth.," ex Franchet, in Bull. Soc. Bot. France, xxxii, p. 8.

This is similar to *M. betonicoides*, Benth., of the Sikkim Himalaya, but the spines are shorter and softer, and the calyx very different, being spathaceous and quite entire except the spines.

Triplostegia Delavayi, Franch., ms., in Herb. Paris.

Caulis e rhizomate bulboso-incrassato fibris incrassatis aucto ortus, 0·3–0·6 m. altus, villosus et glanduloso-pilosus, basi foliis brevibus deinde longioribus praeditus, simplex. Folia media subsessilia, ambitu obovata vel oblanceolata, pinnatifida vel sinuato-lobata lobis inaequaliter serratis, herbacea, in utraque facie pilosa, 4–9 cm. longa, 2–2·8 cm. lata. Panicula terminalis ampla, e corymbis divaricato-ramosis composita, bracteae subovatae, bracteolae 4 ultimae involucellum florem amplectens 2·5 mm. longum formantes, pilosae et stipitato-glanduliferae, apice cymbiformi implicatae atque apice ipso subuncinato-recurvatae. Calyx exterior 8-costatus pilosus, circ. 2 mm. longus ; interior breviter 5–dentatus, dentes triangulares pilosi 0·5 mm. longi. Corolla alba vel roseo-suffusa, pilosa ; tubus gracilis, 6–7 mm. longus, limbi lobi elliptici, 3·5 mm. longi, 2 mm. lati. Stamina lobos fere aequantia, stylus eis aequilongus vel brevior.

" Plant of 1–2½ ft. Root tuberous. Flowers whitish-rose. Open, grassy situations on the margins of pine forests on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 10–11,000 ft. August 1906." G. Forrest. No. 2755.

" Plant of 1–2 ft. Stony pastureland on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. July 1906." G. Forrest. No. 4646.

Also " Mengtze, eastern mountains, 6000 ft." A. Henry. No. 9441.

Easily recognised by its large panicle and much larger corolla. The leaves are deeper cut than in *T. glandulifera*.

EBENACEAE.

Diospyros Balfouriana, Diels. Sp. nov.

Frutex vel arbor 1·5–7 m. alta. Folia (perfectiora non visa, minora ramulorum florentium) petiolo 0·5–1 cm. longo praedita,

papyracea, supra praeter costam pilosam glabra, subtus subglauca, sicca minutissime rugulosa glabra, ovato-oblonga, utrinque angustata, apice acuta, 2·5–4 cm. longa, 1–2·5 cm. lata ; nervi subtus non prominentes, sicci, obscurius colorati. Flores in ramis brevioribus plerumque aphyllis remoti subsessiles, virides, 4–meri. Sepala mox stellato-patentia, extus fere glabra, intus praecipue basin versus albo-pilosa, late ovata, margine extrorsum revoluta, apice obtusa, 2 majora 5–6 mm. longa, 4–5 mm. lata, 2 minora 3·5–4 mm. longa, 2·5–3 mm. lata. Corollae tubus 1·5 mm. longus, limbi lobi subovati, margine ciliolati, recurvi 3·5–4 mm. longi. Staminodia 8 triangularia, pilosa 1 mm. longa. Ovarium apice pilosum, styli 4 apice bifidi, basi pilosi.

" Shrub or tree of 6–20 ft. Flowers green. Open situations in the Tali valley around the city of Tali. Lat. 25° 40′. Alt. 6700 ft. Flow. May–June 1906." G. Forrest. No. 4764.

A very similar plant, but different by the more glabrous flowers, was collected by A. Henry near Mengtze, at 5000 ft. alt. (No. 9898D.)

Is to be placed in the well-known section *Danzleria* (Bert.), Hiern ; it approaches *D. Morrisiana,* Hance.

ERICACEAE.

Gaultheria Forrestii, Diels. Sp. nov.

Frutex ramosus 0·6–1·5 m. altus. Folia in petiolum brevem (0·5–1·3 m. longum) angustata, coriacea, glabra, (sicca) pallida, subtus atrofusco-punctulata, oblonga vel oblanceolata, apice breviter et obtuse acuminata, margine adpresse et leviter repando-serrata, 6–9 cm. longa, 2–3 mm. lata, nervi (sicci) primarii et secundarii pallidiores. Racemi axillares, 3·5–5 cm. longi ; pedunculi pilosuli, bracteae, pedicelli, bracteolae floresque cerini pure albi ; flores odorati. Bracteae pedicellum 1·5–3 mm. longum subaequantes ; bracteolae subovatae sepalis adjunctae eisque simillimae. Sepala ovata, 2 mm. longa, ca. 1·6 mm. lata ; corolla urceolato-campanulata, sub fauce constricta, circ. 5 mm. longa. Staminum filamenta basin versus dilatata, minute papillosa. Dentes hypogyni 10, triangulares, glabri. Ovarium turbinatum sericeum, stylus glaber.

" Low-branched shrub of 2–5 ft. Peduncles, pedicels, and flowers pure waxy white, fragrant. Moist, open situations amongst scrub on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 10–12,000 ft. July 1906." G. Forrest. No. 4175. " August 1906." G. Forrest. No. 4183.

This is a beautiful species, allied to *G. fragrantissima,* Wall.,

and *G. Hookeri*, Clarke, but more glabrous, and remarkable by the pure white waxy inflorescence.

5014 **Rhododendron gymnanthum,** Diels. Sp. nov.

Frutex 0·9–2 m. altus. Folia persistentia; superiorum petiolus ca. 1 cm. longus, lamina papyracea, glabra, oblanceolata, basin versus sensim angustata, apice acuta, 10–12 cm. longa, 2·5–3 cm. lata. Racemus brevis terminalis, pedunculi glabri, sepala brevia ca. 1 mm. longa, corolla infundibuliformi-campanulata, rosea, basi purpurea, superius purpureo-punctata vel striolata, 3·5–4 cm. longa, ore 2·5–3 cm. lata; limbi lobi rotundati, 1·5–2 cm. diamet. Stamina 10, filamenta basi paulo latiora, glabra, 2–3 cm. longa. Ovarium 0·5–0·6 cm. longum, conicum, glabrum, stylus ca. 3 cm. longus.

"Shrub of 3–6 ft. Flowers rose, with crimson markings. Open, rocky situations on the Mekong-Salwin divide, north-west of Tsekou. Lat. 28° 12′ N. Alt. 13,000 ft. August 1904. S.E. Tibet." G. Forrest. No. 5071.

Similar to *Rhododendron likiangense*, Franch. (Tse Kou, Soulié, No. 1000), but differing by shorter and narrower leaves, larger flowers, and the peduncles not being tomentose.

Rhododendron Forrestii, Balf. f. ms., descr. Diels.

Frutex scandens 0·9–1·5 m. altus; rami ultimi breves. Folia breviter petiolata, coriacea, obovata, apice minute mucronulata, margine recurva, subtus purpurascentia glandulosa, nervis reticulatis subbullata, 1·5–2 cm. longa, 0·8–1·2 cm. lata, costa subtus prominens. Bracteae summae latissimae, pallidae, apice minute tomentellae. Calyx obsoletus. Corolla intense kermesina, tubus circ. 2 cm. longus sensim ampliatus, limbi lobi suborbiculares.

"Climber of 3–5 ft. Flowers deep crimson. On moist, moss-covered rocks on the ascent of the Tsedjiong pass, Mekong-Salwin divide. Lat. 28° 10′ N. Alt. 10–11,000 ft. June–July 1905. S.E. Tibet." G. Forrest. No. 699.

In habit similar to *R. dendrocharis*, Franch., but distinguished by the glabrous branchlets, the shorter petioles, the leaves being not lepidote, the calyx obsolete, and the corolla-tube longer. I could not examine the stamens and ovary without destroying the specimen.

5015 **Rhododendron Stewartianum,** Diels. Sp. nov.

Frutex 0·9–2·2 m. altus. Rami pallide corticati, caules novelli breves. Folia (summa) petiolo robusto ca. 1 cm. longo praedita; lamina coriacea, glabra subtus lutescenti-viridis, late obovata, apiculata, 5–7 cm. longa, 3–3·5 cm. lata, subtus

minute reticulata. Flores solitarii (vel pauci?) terminales. Calyx subscariosus, glaber, alte partitus, segmenta late ovata, obtusa, 2–3 mm. longa. Corolla campaniformis, glabra, roseo-flava; tubus 2·2–2·5 cm. longus, ca. 2 cm. latus; limbi lobi suborbiculares, 1·6–2 cm. longi et lati. Stamina ca. 10, ima basi pilosula ceterum glabra, 2·5–3 cm. longa. Ovarium minute glandulosum, stylus glaber.

"Shrub of 3–7 ft. Flowers pinkish-yellow. Open situations on mountain meadows on the ascent of the Tsedjiong pass, Mekong-Salwin divide. Lat. 28° 10′ N. Alt. 10–11,000 ft. June 1904." G. Forrest. No. 5069.

Nearly allied to *R. Mussoti*, Franch., but distinguished by the glabrous (not fimbriate) calyx, the narrower corolla, and the glabrous style.

Rhododendron chasmanthum, Diels. Sp. nov.

Folia petiolo 0·6–1 cm. longo praedita, papyracea, supra glabra subtus squamulis brunneis conspersa, ad costam pilosa, lanceolata, (superiora) 8–10 cm. longa, 2–3 cm. lata. Corymbus terminalis; bracteae lineares, pilosae, deciduae; pedunculi squamulosi 2–2·5 cm. longi. Calycis tubus dense squamulosus, lobi triangulares fusci squamulis ± destituti, ciliati, 2–3 mm. longi. Corollae tubus infundibuliformis extus squamulosus ca. 2–2·5 cm. longus, mox apertus, limbus amplus lobis quam tubo longioribus expansis ca. 5–6 cm. latus. Stamina (ca. 8?), exserta, curvata, basi pilosa, superne glabra, 3–4 cm. longa. Ovarium dense lepidotum. Stylus 3·5–4 cm. longus.

"Shady, rocky situations on the Mekong-Salwin divide to the north-west of Tsekou. Lat. 28° 10′ N. Alt. 10–12,000 ft. September 1904. S.E. Tibet." G. Forrest. No. 513.

From the same district (Monbeig, in Herb. Kew!)

The material is rather scanty. The species is recognised by the very open corolla, the scaly calyx and corolla tube, and the narrow leaves.

4957 **Rhododendron dichroanthum,** Diels. Sp. nov.

Frutex 1–2·5 m. altus. Folia coriacea, supra glabra, inconspicua, rugulosa subtus strato tenui tomentello glauco-albo vestita, oblonga, anguste elliptica, oblanceolata vel obovata, sensim in petiolum dilatatum angustata, apice calloso-mucronulata, cum petiolo 5–10 cm. longa, 1·3–4 cm. lata. Flores 2–5–ni; bracteae late ovatae, acuminatae, pallide fuscae, antrorsum tenuiter lanuginosae, deciduae, pedunculi puberuli 1·6–2·5 cm. longi. Calyx valde variabilis, lobi nunc obsoleti nunc conspicue evoluti (ad 12 mm. longi) rotundi, demum decidui. Corolla carnosa, aurantiaca vel luteo-rosea, campanulata, glabra; tubus 2·5–3

cm. longus, 2–2·5 cm. latus, lobi subrotundi, 1·2–2 cm. diamet. Stamina 10, filamenta puberula. Ovarium dense fulvo-lanuginosum; stylus glaber stamina paulum superans 2·5–3 cm. longus.

"Shrub of 2–4 ft. Flowers yellowish-rose, corolla fleshy. Moist, rocky, shady situations in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. July 1906." G. Forrest. No. 4138.

"Compact shrub of 4–6 ft. Flowers orange. Dry, open, rocky meadows. Same locality. Alt. 11–12,000 ft. July–August 1906." G. Forrest. Nos. 4142, 4157, 4158.

"Shrub of 3–5 ft. Flowers creamy-rose, corolla fleshy. Open, shady situations. Same locality. 10–11,000 ft. July–August 1906." G. Forrest. No. 4165.

This is named *Rhododendron neriiflorum* forma calycis lobis minoribus by Franchet in the Paris Herbarium (Tsang chan, Delavay, No. 2798).

5017 **Rhododendron uvarifolium,** Diels. Sp. nov.

Frutex 6 m. altus. Folia in petiolum latum 12–15 mm. longum angustata, coriacea, supra glabra, subtus strato tenui tomenti argentei nitentis obtecta, anguste oblanceolata, breviter acuminata, 16–22 cm. longa, 4–4·5 cm. lata, nervi laterales primarii utrinque circ. 15 adscendentes. Flores abbreviato-racemosi; bracteae dorso tomentellae, deciduae; pedunculi 2–3 cm. longi, glabrati. Calyx minutus annularis, lobi vix discreti. Corolla carnosa, rosea, purpureo–maculata, campanulata, tubus 2–2·5 cm. longus, limbi lobi circ. 2 cm. diamet. Stamina 10, basi parce pilosula, inclusa. Ovarium fere glabrum, (an semper?) curvatum, 8–10 mm. longum; stylus glaber.

"Shrub of 20 ft. Flowers fleshy, pink, with deep crimson markings. In rhododendron forest on the ascent of the Nin-chang pass from the Yangtse valley to the Chung Tien plateau. Lat. 27° 30′ N. Alt. 7–8000 ft. September 1904." G. Forrest. No. 5072.

This species is recognised by its very long, narrow leaves, silvery white underneath. The flowers of the specimen are not in a good state; they are remarkable by their narrow curved ovary, but this may be a result of an advanced condition.

The leaves of *R. coriaceum*, Franch., from Tsekou, while similar in shape, have a more tomentose covering; the peduncles of this species are ferrugineo-puberulous, the flowers considerably smaller than those of *R. Forrestii*; those of *R. likiangense*, Franch., of the same district, have longer petioles and are glabrous.

Rhododendron Balfourianum, Diels. Sp. nov.

Frutex 1·2–2·8 m. altus. Folia petiolo 1·5–2 cm. longo glabro praedita ; lamina coriacea, supra glabra minute rugulosa, subtus strato crustaceo tomenti subsericeo-nitente vestita, anguste ovata vel oblonga, basi angustata plerumque obtusa apice acuta, 5–8 cm. longa, 2·5–3·5 cm. lata. Flores 5–7–ni ; bracteae dense pubescentes, deciduae ; pedunculi glanduloso-pilosi, 2–3 cm. longi. Calyx purpurascens, glanduloso-pubescens, fere ad basin 5–lobus ; segmenta subelliptica 2–8 mm. longa. Corolla infundibuliformi-campanulata, pallide rosea purpureo-maculata, circ. 2·5 cm. longa, sub limbo 2·5–3 cm. lata ; limbi lobi rotundati vel late elliptici, 1·5–1·8 cm. diamet. Stamina 10 basi villosula, 1·5–2·5 cm. longa. Ovarium glandulosum ; stylus inferne glandulosus superne glaber.

" Shrub of 4–9 ft. Flowers pale rose, with crimson markings, corolla thick and fleshy. Rocky, open mountain meadows on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 11–12,000 ft. July 1906." G. Forrest. No. 4166. " August–September 1906." G. Forrest. No. 4131.

This new Rhododendron is near to *R. adenogynum,* Diels ; but the tomentum of the leaves is silky-shining, the flowers smaller, with crimson markings, the lobes of the corolla less spreading. *R. ochrocalyx,* Franch., and *R. lacteum,* Franch. (= *Faberii,* Hemsl.), are also closely allied.

R. lacteum is different in leaf, number of stamens (12), and the ovary being tomentose.

Rhododendron Beesianum, Diels. Sp. nov.

Frutex 4·5–6 m. altus. Folia petiolo robusto, nonnunquam atropurpureo, glabro praedita ; lamina coriacea, supra glabra minute rugulosa, subtus praeter costam glabram tomento tenui cinnamomeo e pilis radiatim divisis effecto detersili vestita, anguste oblanceolata, basi rotundata, 16–18 cm. longa 5–6 cm. lata, nervi laterales primarii 16–20 utrinque adscendentes. Flores breviter racemosi, bracteae dense pubescentes deciduae ; pedunculi rubri pubescentes. Calyx minutus, annularis, lobi vix discreti. Corolla saturate et intense rosea, ampla, latissime campanulata ; tubus 3–3·5 cm. longus 4·5–5·5 latus ; limbi lobi subreniformes vel suborbiculares, 2–3 cm. longi et lati. Stamina 10 inclusa, basi minute puberula, circ. 3 cm. longa. Ovarium dense ferrugineo-tomentosum, stylus subglaber stamina paulum superans.

" Shrub of 15–20 ft. Flowers deep rich rose. Open pine forests at base of cliffs on the eastern flank of the Lichiang Range.

Lat. 27° 12′ N. Alt. 11–12,000 ft. May 1906." G. Forrest. No. 2323.

R. Beesianum is allied to *R. Delavayi*, Franch., but the leaves and flowers are much larger and the corolla more open. In habit it reminds of *R. setchuenense*, Franch., of Cheng Kou, Northern Szechuan, but this species has a glabrous ovary.

Rhododendron anthosphaerum, Diels. Sp. nov.

Frutex vel arbor 6–9 m. alta. Folia petiolo glabro 1·5 cm. longo praedita; papyracea, supra glabra, subtus rufescenti-pallidiora, oblanceolata, acuta, 8–13 cm. longa, 2·5–5·2 cm. lata, nervi subtus inconspicui. Flores 10–15 dense congesti, pedunculi 7–12 mm. longi, pubescentes. Calycis minuti lobi inconspicui triangulares, glandulosi, vix 1 mm. longi. Corolla intense rosea atropurpureo-maculata, campanulata; tubus 2·5–3·5 cm. longus 3·2–4 cm. latus; lobi rotundati 1·5–2 cm. diamet. Stamina 10 basin versus minute puberula, 3–3·5 cm. longa. Ovarium glabrescens, 5–8 mm. longum; stylus 3–3·5 cm. longus, praeter basin puberulam glaber.

"Shrub or tree of 20–30 ft. Flowers bright rose-magenta, with a few markings of black-crimson. Open situations in pine forests on the ascent of the Sung-kwei pass from the Lang Kung valley. Lat. 26° 30′ N. Alt. 10–11,000 ft. April 1906." G. Forrest. No. 2042.

Habit of R. *irroratum*, Franch., but easily recognised by the colour of the flowers and the more glabrous ovary and the absence of glands on the style.

Rhododendron lacteum, Franch., in Bull. Soc. Bot. France, xxxiii (1886), 231.

Folia basi saepe angustata, nervi laterales primarii supra tenuiter insculpti. Corolla nonnunquam 8–loba, stamina 16.

"Tree of 20–30 ft. Flowers white, fleshy, with a blotch of rich crimson at base of corolla. Open situations in pine forests on the descent from the Sung-kwei pass to the Sung-kwei valley. Lat. 26° 15′ N. Alt. 10–11,000 ft. April 1906." G. Forrest. No. 2159.

var. **macrophyllum,** Franch., in Bull. Soc. Bot. France, xxxiv (1887), 280.

"On uppermost edge of pine belt on hills dividing the Sung-kwei and Lang Kung valleys, three days north of Tali. Lat. 26° 15′ N. Alt. 13–14,000 ft. A tree of 15–30 ft., stems in some instances 12–16 in. in diamet. December 1904." G. Forrest. No. 501.

I do not think that "*macrophyllum*," Franch., is even a

variety. The size of leaves seems to be a fluctuating character of these trees.

Rhododendron adenogynum, Diels. Sp. nov.

Frutex ramosus 1·8–2·5 m. altus. Folia petiolo crasso glabro 1–1·5 cm. longo praedita coriacea supra glabra, sicca minute rugulosa, subtus praeter costam tomento pilis ramosis effecto rufidulo aequali lanuginoso opaco vestita, lanceolato-ovata utrinque angustata apice apiculata 6–9 cm. longa 2–3 cm. lata. Flores 6–10–ni ampli; bracteae dense pilosae deciduae; pedunculi glanduloso-pubescentes 2–3 cm. longi. Calyx purpurascenti-suffusus glanduloso-puberulus fere ad basin 5–lobus; segmenta subelliptica 1–1·5 cm. longa, 0·5–0·7 cm. lata. Corolla carnosula glabra nisi intus basi puberula, fragrans, alba, extus purpureo-suffusa, latissime infundibuliformis demum lobis patentibus fere rotata, tubus 2–2·5 cm. longus, lobi rotundi 2–2·8 cm. longi, 2·5–3 cm. lati. Stamina 10, praeter basin glanduloso-puberulam glabra, 2·5–3 cm. longa. Ovarium dense glandulosum, stylus basi glandulosus superne glaber stamina superans.

"Branched shrub of 6–8 ft. Flowers white, corolla slightly fleshy, tinged pink on exterior, expecially at base, fragrant. Scattered over grassy mountain slopes in small clumps of 3–4 plants. Eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 11–12,000 ft. June 1906." G. Forrest. No. 2395.

This species is allied to *R. Faberii,* Hemsl., in Journ. Linn. Soc. xxvi, 22 (*R. Prattii,* Franch., in Journ. de Bot. ix, 1895, p. 389), but differs from that by its larger, more open corolla, the stamens being puberulous only and the non-hairy ovary. Another similar species, *R. Brettii,* Hemsl. et Wils., in Kew Bulletin, 1910, p. 106, is different by its glabrous leaves. Lastly, the plant mentioned by Franchet as *R. Faberii,* "envoyée à Kew sous le nom de *R. ochrocalyx*" (Delavay, No. 2635), seems to be related, but the indumentum is lighter and the flowers smaller.

Rhododendron taliense, Franch., in Bull. Soc. Bot. France, xxxiii (1886), 232.

Corolla infundibuliformi-campanulata saepe major, 2·5–4·5 cm. limbo 3·5–4 cm. longa, ochroleuca vel alba vel roseo-alba intus purpureo-maculata, (an semper ?) inodora.

"Large branching shrub of 15-25 ft. Flowers pinkish-white, base of the interior of corolla deep crimson. Open, rocky slopes on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 12,000 ft. May 1906." G. Forrest. No. 2408.

"Branching shrub of 10–20 ft. Flowers white, with a crimson blotch on interior of corolla. Possibly a variety of No. 2408. Umbels looser, and formed of fewer flowers, those larger. Leaves

broader, with the under surface of a lighter shade." Same locality. G. Forrest. No. 2409.

"Loosely branched shrub of 4–5 ft. Flowers pinkish-white, with crimson markings. Dry, rocky situations on mountain meadows on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. August 1906." G. Forrest. No. 4136.

"Shrub of 15–25 ft. Flowers pale yellow. In and on the margins of pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 12,000 ft. August 1906." G. Forrest. 4160.

"Shrub of 4–8 ft. Flowers pale creamy-yellow. Moist, rocky situations in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 11–12,000 ft. July-August 1906." G. Forrest. No. 4167.

The species is recognised by the tomentum of the under side of the leaves, by its glabrous ovary and hairy stamens. The size of leaves and flowers is variable; the colour of the corolla varies from pale yellow to pinkish-white.

Rhododendron Souliei, Franch., in Journ. de Botan. ix (1895), 393.

Filamenta speciminum nostrorum basi paleaceo-pilosa. Ovarium glandulis stipitatis dense obtectum; stylus superne glaber stamina superans, nonnunquan e corolla exsertus.

"Shrub of 4–8 ft. Flowers pale rose. Open, rocky situations on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. July 1906." G. Forrest. No. 4148.

"Shrub of 6–10 ft. Flowers rose-pink. Dry, rocky situations on mountain meadows on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. July 1906." G. Forrest. No. 4150.

"Shrub of 3–6 ft. Flowers bright lavender-rose. Open mountain meadows on the margins of pine forests and cane brakes on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 11–12,000 ft. August 1906." G. Forrest. No. 4154.

Rhododendron chartophyllum, Franch., in Journ. de Bot. ix (1895), 396; Pl. nouv. Chin. occ. p. 74.

"Erect shrub of 4–9 ft. Foliage deciduous. Flowers from pure white to blue-lavender, with a few deep green markings. Dry or moist situations amongst scrub in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,500 ft. May–June 1906." G. Forrest. No. 4163.

3845 f. **praecox.**

Flores foliis delapsis ante novella evoluta orti.

" Erect or spreading shrub of 4–8 ft. Flowers white, in some specimens pinkish on exterior of corolla, with rich crimson markings. Foliage deciduous. Flowers appearing first. Amongst dwarf scrub, in open situations on the ascent of the Sung-kwei pass from the Lang Kung valley. Lat. 26° 30′ N. Alt. 9000 ft. April 1906." G. Forrest. No. 2030.

EUPHORBIACEAE.

Euphorbia megistopoda, Diels. Sp. nov.

Rhizoma napiforme, percrassum, subhorizontale, hinc inde caules gignens. Caules longe hypogaei nudi tenues, deinde hypophyllis squamiformibus obtecti, apice epigaei 5–7·5 cm. longi pubescentes, folia ramosque et steriles et florigeros subcorymbose emittens. Folia breviter oblanceolata spathulata vel oblonga, glabra, 1–1·5 cm. longa, 0·3–0·5 cm lata. Rami floriferi quam rami steriles breviores, 2·5–3 cm. longi. Folia floralia quam cetera latiora involucrantia, flavescentia. Cyathium pubescens ; lobi longius ciliati 0·6 mm. longi, 1·5–1·8 mm. lati ; glandulae glabrae, transverse ellipticae, 0·5 mm. longae, ca. 2 mm. latae. Ovarium glabrum ellipsoideum, 1·5 mm. longum ; styli 3 liberi, 1·5 mm. longi, apice obsolete bilobi.

" Plant of 2–3 inches. Bracts and flowers greenish-yellow. Damp, peaty ground in openings in scrub on the eastern flank of the Lichiang Range. Lat. 27° 10′ N. Alt. 10,000 ft. June 1906." G. Forrest. No. 2237.

Very close to *E. bupleuroides,* Diels, but distinguished by the broader cauline leaves and the sterile branches exceeding the inflorescence ; perhaps only a habitat-form of *E. bupleuroides.*

Euphorbia bupleuroides, Diels. Sp. nov.

Caulis 7–20 cm. longus, inferne foliis remotis brevibus nonnunquam squamiformibus tectus, superne ramosus atque foliatus, cum ramis pubescens. Folia linearia, anguste oblonga vel oblanceolato-linearia, costata, glabra, subtus subglaucescentia, 1·2–1·8 cm. longa, 0·25–0·4 cm. lata. Rami florigeri corymbum ramos steriles superantem efficientes 3–6 cm. longi. Folia floralia quam cetera multo latiora, late ovata vel late elliptica nonnunquam suborbiculari-rhombea, 0·7–1 cm. lata, flava. Cyathium cum lobis dense pubescens ; glandulae subreniformes, crassiusculae, glabrae, 1·5 mm. longae, 2·5 mm. latae. Ovarium glabrum, styli praeter basin liberi apice bilobi.

" Barren pine woods between Chen-nam cho and Sha-chiao. March 1905." G. Forrest. No. 224.

" Plant of 6–8 inches. Flowers greenish-yellow. Dry, stony

ground on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8-9000 ft. June-August 1906." G. Forrest. No. 4596.

" Plant of 3–6 inches. Flowers yellow. Dry, clayey pasture in the Salwin valley. Lat. 24° 40′ N. Alt. 4000 ft. April 1906." G. Forrest. No. 5008.

Allied to *E. Stracheyi*, Boiss., but taller, the leaves of the stem and branches narrower, the floral ones deeper yellow, the cyathium more pubescent.

Euphorbia glaucopoda, Diels. Sp. nov.

Caulis adscendens, 0·45–1 m. altus, apicem versus pubescens. Folia in petiolum brevem basi conspicue glaucum sensissime angustata, oblanceolata, integra, glabra, costata, praeterea nervis obsoletis praedita, 6–10 cm. longa, 1·7–2·3 cm. lata. Corymbi in apice caulis axillares et terminales, pedunculi 2·5–4 cm. longi, puberuli. Folia floralia valde reducta, 4–6 mm. diamet., viridia, late ovata vel triangularia, apice saepe obtusissima vel rarius acuta. Cyathia solitaria, parva, glabra, 1·5 mm. longa; lobi 1 mm. diamet., altius bifidi; glandulae meniscoideo-obreniformes, glabrae, 0·6 mm. longae, circ. 2 mm. latae. Capsula laevis; semina lucida.

" Erect plant of 1½–3 ft. Moist situations by streams in dense jungle. On the ascent of the Irrawadi-Ming Kwang divide. Lat. 25° 45′ N. Alt. 7–9000 ft. N.W. Yunnan. October 1903." G. Forrest. No. 962.

This remarkable species is in habit somewhat similar to *E. khasyana*, Boiss., but very different in the structural details of the cyathia, also easily distinguished by the short hairiness of the peduncles.

Euphorbia Bulleyana, Diels. Sp. nov.

Caudex lignescens repens, caules adscendentes, 0·3–0·45 m. alti, glabri, basi nudi vel hypophyllis squamiformibus obtecti, deinde foliis sparsis ramisque axillaribus foliatis brevibus praeditus. Folia basi contracta, lanceolata vel lanceolato-oblonga, integra, caulis primarii 3–3·5 cm. longa, 3·8–1 cm. lata, ramorum minora, herbacea, subtus glaucescentia, glabra, costa supra pallidior. Folia floralia latiora, breviora, rubescentia, summa involucrantia late cordato-triangularia, ca. 1 cm. longa et lata. Cymae vel in axillis foliorum superiorum longe pedunculati vel terminales, nutantes. Cyathium glabrum, 2·5 mm. longum; lobi parvi; glandulae transverse ellipticae, 1 mm. longae, 2 mm. latae. Ovarium laeve longius stipitatum, nutans, 1·5 mm. longum; styli 3 apice incrassati, 1 mm. longi.

" Plant of 1–1½ ft. Flowers nodding, bracts ruddy green.

Moist, shady situations in pine forests and on mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 10′ N. Alt. 9–10,500 ft. May 1906." G. Forrest. No. 2231.

This species is apparently not closely allied to any other of the region, and easily recognised by its nodding, ruddy green inflorescences.

GENTIANACEAE.

Gentiana asterocalyx, Diels. Sp. nov.

Annua. Caulis ramosus, 7–15 cm. longus, purpurascens. Folia pallida, basalia late lanceolata, caulina anguste lanceolato-subulata, margine subhyalina, 10–12 mm. longa. Flores ad ramorum apices solitarii, sessiles. Calycis 15–nervii tubus 5–6 mm. longus, 3–3·5 mm. latus; dentes tubo sublongiores, margine involuti, aristato-subulati, demum stellato-patentes, scaberuli ca. 8–9 mm. longi. Corolla extus viridis intus intense coerulea, tubus subobconicus 7–11 mm. longus, lobi limbi triangulares ca. 5 mm. longi, plicae fere duplo breviores. Ovarium brevissime stipitatum, infundibuliforme, ca. 5 mm. longum; stylus papillosus 4 mm. longus.

" Plant of 3–6 inches. Corolla interior bright blue, exterior green. Dry situations in open pine forests on the eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 11,000 ft. June 1906." G. Forrest. No. 2415.

An ally of *G. scariosa,* Balf. f. et Forrest, but a taller plant, distinguished also by the leaves being less crowded, the longer calyx, with teeth finally spreading and exceeding in length the tube of the corolla, and by the short stipes of the ovary.

Gentiana decorata, Diels. Sp. nov.

Planta e basi multicaulis, caulibus decumbentibus caespitosa, 2·5–5 cm. alta. Folia ad caulis partem superiorem conferta, parva, basi vaginata connata, lanceolata, spathulata, vel oblanceolata, apice ± acuta, margine obsolete papillosa, 1·5–5 mm. longa, vix 1–1·5 mm. latiora. Flores solitarii caules terminantes. Calycis tubus 3–4 mm. longus, lobi foliacei suboblanceolati vel anguste spathulati, breviter mucronulati, 3–4 mm. longi. Corolla intense coerulea; tubus 5–6 mm. longus, lobi elliptici valde concavi, latere altero appendice dentiformi praediti, 8–9 mm. longi. Ovarium cum stylo stigmatibusque demum revolutis 12–13 mm. longum. Antherae intense coeruleae.

" Plant of 1–2 inches. Flowers deep indigo-blue. Forming tufts on ledges of cliffs and on humus-covered boulders on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 13–14,000 ft. September 1906." G. Forrest. No. 3021.

" Plant of 1–2 inches. Flowers deep purplish-blue, striped a brighter shade. Moist, open, stony pastureland on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. September 1906." G. Forrest. No. 3827.

Apparently allied to *G. infelix*, Clarke, but, in our plant, the leaves are narrower, the calyx narrower, and the flower more than double as large.

Gentiana Georgei, Diels. Sp. nov.

Planta 5–7·5 cm. alta, rosulas steriles et caules florentes gignens. Folia rosularum sterilium ad 6 cm. longa, 0·8–1 cm. lata ; folia caulium florentium saepe breviora, infima reducta, cetera lanceolata basi imbricata, ad 4 cm. longa, 1 cm. lata, saepe purpurascentia, margine dense albo-papillosa. Flos solitarius sessilis. Calycis tubus pallidus subhyalinus, 2–2·3 cm. longus, ore fere truncatus ; sepala lanceolata parte infera tubo quasi adnata, supera 1–1·5 cm. libera purpurascentia costa margineque albo-papillosa. Corolla elongato-campaniformis, intense purpurascenti-coerulea extus viridi-striata atque basi viridis, 6 cm. longa ; tubus ore 2–2·5 cm. lata ; segmenta late triangularia, 0·8 cm. longa et lata, plicae vix asymmetricae, triangulares, 0·4 cm. longae, 0·7–0·8 cm. latae. Ovarii stipes 0·6-0·7 cm. longus ; ipsum 1·5–1·7 cm. longum, stylus 1–1·2 cm. longus. Stamina aequalia.

" Plant of 2–3 inches. Corolla deep purplish-blue interior, exterior striped greenish with the base green. Open mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. October 1906." G. Forrest. No. 3110.

Very near *G. callistantha*, Diels et Gilg., of the Semenov Range, North-eastern Tibet, but differing by the sterile rosettes, the equal stamens, and the colour of the corolla being an intense blue, not a pale greenish-white. Another still nearer species is *G. rosularis*, Franch., of Tatsienlu, which is a smaller plant, having the rosulate leaves much shorter and the corolla narrower. Possibly, *G. Georgei* is only a variety of Franchet's species.

Gentiana Harrowiana, Diels. Sp. nov.

Planta caespitosa rosulas et steriles et florentes 2·5–5 cm. longas gignens. Folia conferta, crassiuscula herbacea, glabra, spathulata vel obovata, obtusa 1–1·5 cm. longa, 0·5–0·7 cm. lata ; nervi praeter costam obsoleti. Flores plerumque complures conferti. Calyx subhyalinus, pallidus, paulo inflatus ; tubus circ. 10 mm. longus, dentes herbacei, virides, anguste triangulares 2·5 mm. longi. Corolla intense coerulea, extus viridescens ; tubus ca. 15 mm. longus, limbi lobi ovato-triangulares

3–3·5 mm. longi, plicae asymmetricae introrsum protrusae lobis breviores. Stamina 6–7 mm. longa. Ovarii stipes 6–7 mm. longus; ipsum 8 mm. longum, stylus cum stigmate papilloso 2–2·5 mm. longus.

"Procumbent plant of 1–2 inches. Flowers bright blue, exterior greenish-blue. Open, rocky mountain pastureland on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 3825.

Allied to *G. chinensis*, Kusnezow, of Szechuan, but the stems of our plant are shorter, the leaves closer set, the calyx relatively larger, broader, paler, and the corolla much shorter.

2946 **Pleurogyne oreocharis,** Diels. Sp. nov.

Caulis simplex, 7–15 cm. longus, erectus, glaber, 1–2-florus. Folia petiolo 0·5–1 cm. longo dilatato praedita, late ovata vel subrotunda, 0·8–1·2 cm. longa, 0·6–0·9 cm. lata, glabra. Flores ampli. Sepala spathulata 0·7–1 cm. longi. Petala stellato-expansa, extus viridula, intus coerulea purpureo-suffusa, intense coeruleo-striata, anguste obovata vel oblonga, 1·8–2 cm. longa, 0·7–1 cm. lata; foveolae binae inaequilateraliter infundibuliformes, ore fimbriatae, ca. 2–2·5 mm. longae. Stamina 0·8–1 cm. longa. Ovarium (siccum aurantiacum), anguste cylindricum, 1·2–1·5 cm. longum.

"Plant of 3–6 inches. Flowers blue, with a pinkish tinge, striped deep blue, green on exterior. Open, rocky situations on mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 3024.

This beautiful species is similar in foliage to *P. carinthiaca*, L. From both *P. macrantha*, Diels et Gilg, and *P. bella*, Hemsl., it is easily distinguished by the shape of the stalked leaves and the simple stems.

913 **Swertia (Ophelia) hypericoides,** Diels. Sp. nov.

Annua. Caulis basi simplex, deinde brevi-ramosus, 15–30 cm. longus. Folia basalia tempore florendi marcescentia, caulina sessilia oblonga vel anguste obovata, 1–3-nervia, obtusa vel acuta, 2–2·5 cm. longa, 4–6 mm. lata, superiora angustiora. Panicula ramis suberectis angusta, pedicelli calycem saepe superantes. Sepala lanceolata vel oblanceolata, mucronulata, 5–6 mm. longa; petala diaphana, pallide cinereo-coerulescentia, anguste ovata acuminata, foveolis 2 sejunctis membrana conspicue ciliata ornatis supra basin praedita, 6–7 mm. longa. Stamina 4–5 mm. longa, gynaeceum subaequantia.

"Plant of 6–12 inches. Corolla transparent, of a pale, watery bluey-gray. Dry, barren pastureland at the base of the foothills

of the Lichiang Range. Lat. 27° 10′ N. Alt. 25–2600 m. July 1906." G. Forrest. No. 2542.

This is very near *S. punicea*, Hemsl. The colour of the flower is very variable in that species (cp. Franchet, in Bull. Soc. Bot. France, xliii, p. 318): brown, purple, or yellowish. But the curious pale, watery, bluish colour of the small flowers of Forrest's plant has apparently not yet been observed. Possibly, it may be only a form of *S. punicea*, Hemsl.

Swertia calicina, Franch. var **major,** Diels. Var. nov.

Omnibus partibus forma typica multo major. Caulis 20–30 (non 8–12 cm.). Folia inferiora cum petiolo 15–17 cm. longa, 2 cm. lata. Sepala 20–25 mm. (non 15–18 mm.) longa, 5–7 mm. lata, interiora angustiora. Petala pallide citrina, 20–25 mm. longa, 8–12 mm. lata.

"Plant of 9–12 inches. Corolla pale lemon yellow, veined purplish towards base, with the base purple maroon. Shady, grassy openings in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11,000 ft. September 1906." G. Forrest. No. 2926.

The typical form was collected in the same neighbourhood: "coteaux de Likiang-Senchan, alt. 4000 m." (Delavay, No. 2208), but is a much smaller plant than this fine variety.

GERANIACEAE.

Oxalis leucolepis, Diels. Sp. nov.

Stolones radicantes hypophyllis remotis bulbilloso-incrassatis cretaceo-albis praediti; hypophylla basalia caulis florentis pauca (1–3) eodem modo incrassata et conspicue alba. Folia petiolo 4–6 cm. longo praedita, membranacea; foliola late obcordata, parce pilosula, glabrescentia, subtus glauca, ca. 1 cm. longa, 0·8–1·2 cm. lata. Pedunculus 6–10 cm. longus. Sepala anguste ovato-oblonga, ciliolata, 4–5 mm. longa, 1·5–2 mm. lata. Petala angusta oblanceolata vel subcuneata, apice incisa biloba, 10–12 mm. longa, 3–4 mm. lata, alba venis purpureis picta. Stamina circ. 4 mm. longa. Ovaria 1·5 mm. longa, styli 4·5 mm. longi.

"Plant of 2–4 inches. Flowers white, veined deep purple. Open, moist situations on humus-covered boulders in a side valley on the eastern flank of the Tali valley. Lat. 25° 40′ N. Alt. 9–10,000 ft. July–August 1906." G. Forrest. No. 4287.

I do not know if this interesting form will prove specifically different from *O. Acetosella*. By describing it, I want to draw the attention of the collectors to it. Forrest's specimen is certainly

very different from the typical *O. Acetosella*, *c.g.* Forrest, No. 2144, by its much smaller size in all parts, the relatively longer peduncle (much exceeding the leaves), the very few scales at the base of the flowering shoot, their bulbous development and curious chalky-white colour, the very narrow bifid petals, and the late time of flowering.

GESNERACEAE.

Roettlera Forrestii, Diels. Sp. nov.

Folia rosulata ; exteriora petiolata, interiora sessilia, herbacea, dense ferrugineo-villosa, anguste ovata vel suboblonga, grosse dentata dentibus integris vel iterum crenulatis, cum petiolo 8–14 cm. longa, 3–4·5 cm. lata, nervi primarii 5–6 subtus prominentes. Scapi complures, 7–20 cm. longi 4–7–flori, ferrugineo-villosi vel glanduloso-pilosi. Calyx alte 5–partitus, segmenta subovata, pilosa, 5–7 mm. longa, 2·5–3 mm. lata. Corolla lutea ; tubus late cylindricus, pilosulus, 9–10 mm. longus, 6–7 mm. latus, lobi 3–5 mm. longi, 3–4 mm. lati. Stamina 2 fertilia 5–7 mm. longa, staminodioidea 5 mm. longa. Discus 1 mm. altus. Ovarium 3–4 mm. longum, stylus perbrevis, stigma patelliforme 1–1·5 mm. longum. Capsula circ. 2·5 cm. longa, 0·4 mm. lata.

" Plant of 3–9 inches. Flowers canary yellow. On moss-covered boulders and branches of trees in very shady situations on the eastern flank of the Lichiang Range. Lat. 27° 15′. Alt. 10–11,000 ft. July 1906." G. Forrest. No. 2510.

Allied to *R. aurea*, Franch., but quite different by the sessile inner leaves, the longer sepals, and the shorter and broader corolla.

Didissandra amabilis, Diels. Sp. nov.

Rhizoma gracile, repens. Caulis solitarius, adscendens vel erectus, 15–25 cm. longus, longe nudus, apice folia conferta 3–4 majora atque nonnulla minuta floresque 2 rarius 3 gignens. Folia breviter petiolata vel sessilia ; lamina tenuiter herbacea, praecipue supra strigulosa subtus pallidior nonnunquam violascens, obovata saepe asymmetrica, basin versus angustata ibique integra, ceterum serrata, 7–10 cm. longa, 3–6·5 cm. lata. Flores pedunculo bibracteolato 2–4 cm. longo gracili praediti, insignes. Sepala pallida parce pilosa, anguste ovata vel lanceolata, 1·2–1·5 cm. longa, 0·3–0·45 cm. lata. Corolla aurantiaco-flava, fusco-maculata ; tubus latus, paulo inflatus, 2·5–2·7 cm. longa, 1·7–2·2 cm. lata, labii superi 1·4 cm. longi, lobi 3 circ. 6–8 mm. longi, 5–7 mm. lati, labii inferi lobi 5–6 mm. longi, 7–8 mm. lati. Stamina in tubo inclusa. Ovarium ca. 8 mm. longum ; stylus 1–1·3 mm. longus.

"Plant of 6–9 inches. Flowers light-yellow, spotted purple. Moist moss-covered ledges and crevices of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 10–11,000 ft. August 1906." G. Forrest. No. 2689.

"Plant of 6–12 inches. Flowers orange-yellow, spotted orange-brown. On trees and humus-covered boulders in shady situations in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. July–August 1906." G. Forrest. No. 4385.

The leaves are arranged about as in *Didymocarpus oblonga*, DC., but everything else is different.

Didissandra muscicola, Diels. Sp. nov.

Acaulis. Folia subsessilia, ad basin et marginem pilis multicellularibus fuscis vestita, praeterea in utraque facie densissime cinereo-velutina, lanceolato-ovata vel oblonga, conspicue serrata, 8–10 cm. longa, 2–3·8 cm. lata. Scapi pilis fuscis patulis vestiti, 20–30 cm. alti, apice corymboso–3–4–flori; pedicelli graciles, 3–3·5 cm. longi. Sepala anguste ovata, glanduloso-pilosa, 5 mm. longa, 1·8 mm. lata. Corolla intense aurantiaca, campanulata, sub fauce constricta, 30 mm. longa, 15 mm. lata; labii superioris lobi 2 breves, labium inferius longius, lobi semiorbiculares ciliolati, 5–6 mm. longi. Capsula subclavata, 3·5–4·5 cm. longa, 0·4 cm. lata, stylo apice breviter bilobo circ. 0·5 cm. longo praedita.

"Plant of 6–12 inches. Flowers deep orange. On moss-covered boulders and trees in shady rhododendron forest in side valleys of the Mekong, Mekong-Salwin divide. Lat. 27° 30′ N. Alt. 7–8000 ft. July 1905." G. Forrest. No. 5095.

A similar plant with smaller flowers from Northern Szechuan, Cheng Kou (Farges, No. 1455) is in the Paris Herbarium (unnamed).

Boea arachnoidea, Diels. Sp. nov.

Caulis erectus, 15–30 cm. altus, ubique praecipue ad foliorum insertiones arachnoideo-lanuginosus. Folia inferiora petiolo 5–6 cm. longo, floccoso-lanuginoso praedita, lamina membranacea, supra pilosula, subtus ± lanuginoso-pilosa, e basi obtusa ovata vel elongato-elliptica, crenato-serrata, usque ad 10 cm. longa, 3·5 cm. lata. Folia superiora multo minora. Inflorescentiae ex axillis foliorum omnium ortae, corymbosae, pedunculis 2–3 cm. longis praeditae; pedicelli 1·5–2 cm. longi, dense lanuginosi. Flores adhuc ignoti. Sepala 5 anguste ovata, membranacea, 6 mm. longa, 2 mm. lata, trinervia, apice ustulato-callosa, fructifera omnino reflexa, arachnoideo-pilosa. Capsula torta, circ. 2 mm. longa. Semina ovoidea castaneo-fusca exappendiculata.

"Plant of 6–12 inches, growing in clefts of cliffs in the Ming Kwang valley, near Pei sha. Lat. 25° 25′ N. Alt. 6–7000 ft. Fruiting October 1905." G. Forrest. No. 929.

In habit this is somewhat similar to *Chirita hamosa*, Wall., of India and Southern Yunnan.

HAMAMELIDACEAE.

Corylopsis yunnanensis, Diels. Sp. nov.

Frutex 1–3 m. altus. Rami graciles, adulti cortice brunneo, atropurpureo vel purpureo-fusco albo-lenticellato tecti, novelli glauco-pruinosi. Folia petiolo glauco et piloso 0·7–1·2 cm. longo praedita, chartaceo-herbacea, supra glabra, subtus glauca, primum sericeo-pilosa demum ad nervos rufos pilosa ceterum glabra,inaequilateraliter subovato-elliptica vel obsolete pentagona, basi subtruncata ipsa fere cordato-incisa, apice triangulari acuta, leviter repando-serrata serraturis incurvatis, 5–6 cm. longa, 3–3·5 cm. lata ; nervi subtus prominuli circ. 8 utrinque adscendentes. Folia tempore florendi haud evoluta, novella stipulis magnis scariosis, extus saepe purpureis glabris vel pubescentibus intus dense sericeo-tomentellis concavis late obovatis vel suborbicularibus, 1–1·8 cm. longis 1·2 cm. latis occulta, in ramulis floriferis 2–3–na postea evoluta. Spicae densae pendulae, 1·5–2·5 cm. longae ; bracteae scariosae suborbiculares, longe pilosae, circ. 6 mm. diamet. ; bracteolae similes sed multo minores, 3–4 mm. longae, 1·5–2 mm. latae. Calycis segmenta triangulari-ovata, dorso pilosa, 1·5–2 mm. longa, nonnunquam basi appendiculo minuto aucta ; petala ampla, conspicua, lutea vel intense flava, suborbicularia, subito in unguem contracta, 6–7 mm. longa, 5–6 mm. lata ; "nectaria" 10, crassa, 0·5–1 mm. longa, apice truncata atque subimplicata. Stamina 4–5 mm. longa. Styli 2–2·5 mm. longa, basi incrassata parce pilosa. Capsula parte infera longitudinaliter costata, supera pilosa, stylis extrorsum curvatis persistentibus coronata.

"Shrub of 10–20 ft. Flowers pale yellow. Open situations in mixed forests in side valleys on the eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 10–11,000 ft. Fruiting September 1996." G. Forrest. No. 3098.

"Shrub of 4–10 ft. Flowers light orange yellow. Dry, open situations on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. Flow. May 1906." G. Forrest. No. 4095.

"Shrub of 6–10 ft. Flowers bright yellow. Moist situations in thickets on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. April 1906." G. Forrest. No. 4731.

Allied to *C. sinensis*, Hemsl. in Garden. Chronicle 1906, i. p. 18, and Hook. Icon. pl. 2820, fig. 17–20, but different in foliage, number and structure of staminodes, and with shorter styles.

LABIATAE.

Plectranthus oreophilus, Diels. Sp. nov.

Planta gracilis, 15–25 cm. alta. Folia 4–5, in ima basi caulis rosulato-conferta, herbacea, subsessilia, basin versus cuneato-angustata, herbacea, glandulosa et in utraque facie molliter pilosa, late ovata margine crenata, 4–6 cm. longa, 3–3·5 cm. lata. Scapus gracilis. Racemus e verticillastris subremotis 1–1·5 cm. longis compositus 7–12 cm. longus. Bracteae purpureo-violascentes, anguste ovatae, 2–4 mm. longae. Calyx coloratus, bilabiatus, glanduloso-puberulus, labia circ. 3 mm. longa. Corolla declinata coerulea, tubus gibbus, 5 mm. longus, 2·5 mm. latus, labium superius 3–fidum, lobo mediano iterum brevius bifido, 4 mm. longum, labium inferius 5–6 mm. longum.

" Plant of 6–9 inches. Flowers blue. Open situations on the margins of pine forests on the eastern flank of the Lichiang Range. Lat. 27° 12′. Alt. 10–11,000 ft. July 1906." G. Forrest. No. 2564.

In flower this is similar to *P. excisus*, Maxim., but a much smaller plant, very different in foliage, the leaves without the characteristic cuspidate apex of Maximowicz's plant.

Plectranthus phyllopodus, Diels. Sp. nov.

Caulis 0·3–0·45 m. altus, quadrangulus, pilosus, basi ipsa aphyllus, dein foliatus. Folia petiolo longo sensim in laminam obcuneato-dilatato 2–4·5 cm. longo praedita ; lamina herbacea, in utraque facie pilosa, triangulari- vel subrhombeo-ovata, crenato-dentata, 4–6 cm. longa, 3–4 cm. lata. Inflorescentia paniculata vel racemosa, angusta e cymis breviter pedunculatis divaricato-ramulosis composita, bracteae pedicellique graciles. Calyx nigro-glandulosus, 2 mm. longus, minute pubescens, dentes subaequales triangulari-ovati. Corolla coerulea ; tubus gibbus 4 mm. longus, labium superius 4-fidum 2·5–3 mm. longum, inferius 3·5 mm. longum.

" Plant of 1–1½ ft. Flowers pale blue. Open pasture on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. May–June 1906." G. Forrest. No. 4555.

" Plant of 12–15 inches. Flowers blue. Margins of pine forests and on mountain meadows on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. July–August 1906." G. Forrest, No. 4556.

Allied to *P. Cavaleriei*, Léveillé, but morerobust, leaves broader, more hairy, less glandular, with smaller teeth ; the flowers larger.

Plectranthus pleiophyllus, Diels. Sp. nov.

Frutex 1–1·4 m. altus. Ramuli glanduloso-puberuli, foliati. Folia brevissime petiolata, herbacea, supra minute glanduloso-puberula, subtus parcius eisdem glandulis conspersa, ovata vel rotundata, basi ipsa integra, ceterum regulariter serrata, 3·5–4 cm. longa, 2–2·5 m. lata. Cymae e foliorum axillis longe pedunculatae, inferiores circ. 4 cm. longae. Calyx subglandulosus, 4–5 mm. longus, dentes subaequales triangulares. Corollae tubus basi gibbus calycem vix superans. Corolla intense coerulea ; labium superius 4–fidum, circ. 3 mm. longum, inferius 5–6 mm. longum tubo longius.

"Shrub of 3–5 ft. Flowers bright blue, foliage aromatic. Dry, rocky situations amongst scrub in side valleys on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 9–10,000 ft. June 1906." G. Forrest. No. 2333.

Recognised by the branches being leafy to the top, the cymes axillary, the corolla-tube very short.

Plectranthus adenanthus, Diels. Sp. nov.

Caules 15–30 cm. alti, basi ramosi, ceterum subsimplices. Folia inferiora pauca minora, media rhombeo-ovata in petiolum sensim angustata, antrorsum subdentata, supra glandulosa et breviter pilosa, subtus pallidiora, praeter glandulas nonnisi ad nervos puberula, cum petiolo 4–5 cm. longa, 2·5–3 cm. lata Panicula (vel racemus) angusta e cymis composita. Cymae e bractearum mox decrescentium axillis ortae, 1–1·5 cm. longae, 3–5–florae. Flores graciliter pedicellati. Calyx violascens, nervosus, pilosus, 2·5 mm. longus, 3 mm. latus, dentes triangulares subaequales. Corolla coerulea glandulosa, tubus brevis basi gibbus 4 mm. longus, labium inferius circ. 6 mm. longum.

"Plant of 6–12 inches. Flowers blue. Grassy situations in and on the margins of pine forests on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 10–11,000 ft. August 1906." G. Forrest. No. 4557.

Allied to *P. melissoides*, Benth. of the Khasia Hills. In habit and foliage it is also similar to *P. irroratus*, Forrest, but the corolla-tube is much shorter.

Plectranthus irroratus, G. Forrest, ms. in schedis. Sp. nov.

Frutex 0·6–0·9 m. altus. Ramuli pubescentes, purpurascentes. Folia breviter petiolata, late ovata, basi oblique truncata, serrata, supra ubique et subtus ad nervos hispidula, glandulosa, subtus glauca. Racemus foliatus, cymae ex axillis foliorum

superne decrescentium ortae, inferiores 1–1·5 cm. longe pedunculatae. Calyx coloratus hispidulus, 5–6 mm. longus, dentes lanceolato-ovati. Corolla coerulea pilosula; tubus 10 mm. longus, labia circ. 5 mm. longa.

"Shrub of 2–3 ft. Flowers blue. Dry shady situations amongst underscrub in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 9–10,500 ft. June 1906." G. Forrest. No. 2507.

In habit this is not unlike *P. pharicus*, Prain, of Eastern Tibet, but the flowers are much larger, and the lip relatively much shorter.

Plectranthus Forrestii, Diels. Sp. nov.

Species 0·6–1·8 m. alta. Caules quadranguli pilosi. Folia herbacea, utrinque pilosa, ovata, in petiolum cuneato-angustata, margine crenato-dentata, cum petiolo 7–10 cm. longa, 5–7 cm. lata. Inflorescentia paniculata, ad 30 cm. longa; cymae saepe compositae, laxiflorae. Calyx aperte-campanulatus, coloratus, pilosus, 5 mm. longus, dentes quam tubus breviores, late triangulari-ovati, 2·5 mm. lati. Corolla intense coerulea, in latere infero pilosula, tubus circ. 10 mm. longus basi gibbus, 4 mm. latus; labium superius 4–fidum 6–7 mm. longum, inferius 6–7 mm. longum.

"Plant of 2–4 ft. Flowers bright blue. Whole plant strongly aromatic. Grassy openings in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 20′. Alt. 11,000 ft. August 1906." G. Forrest. No. 2851.

Nearly related to *P. irroratus*, Forrest, but the inflorescence is much larger, more open, the bracts smaller, the pedicels longer, the calyx teeth shorter and broader.

Plectranthus Bulleyanus, Diels. Sp. nov.

Frutex humilis, 0·6–0·9 m. altus. Ramuli ultimi subherbacei, quadranguli, purpurei. Folia anguste ovata, in petiolum cuneato-angustata, herbacea, glandulosa, supra praeterea breviter hispidula, margine dentata, cum petiolo 4–6 cm. longa, 2–2·5 cm. lata. Racemus e cymis brevissimis compositus, angustus, 6–8 cm. longus; cymae e bractearum mox reductarum axillis ortae. Calyx pilosulus, 2·5 mm. longus; dentes subaequales ovato-triangulares. Corolla intense coerulea basi rosea pilosula; tubus 5–7 mm. longus basi gibbus, labium superius 4–fidum circ. 4 mm. longum, inferius 5–6 mm. longum.

"Dwarf shrub of 2–4 ft. Flowers deep blue, pinkish at base of corolla. Dry situations amongst scrub on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 8–9000 ft. June 1906." G. Forrest. No. 4554.

This species has relatively narrow leaves, and a very narrow inflorescence with small bracts. The calyx is small, the corolla relatively large, with a longer tube.

Plectranthus phyllostachys, Diels. Sp. nov.

Frutex 0·9–3 m. altus. Rami patenti-pilosi. Folia (inferiora non visa), summa subsessilia, utrinque rugosa, pilosa, e basi subcordata ovata, argute crenato-dentata, 3 cm. longa, 2 cm. lata, nervi subtus reticulato-prominentes. Verticillastri parvi in axillis foliorum sensim decrescentium fere occulti, paniculam c thyrsis foliatis elongatis angustis compositam efficientes. Flores breviter pedicellati vel subsessiles, calyx aequaliter 5–dentatus, dense pilosus, 2·5 cm. longus; corollae luride luteae puberulae tubus 3 mm. longus, labia 3 mm. longa. Stamina faucem attingentia.

"Shrub of 3–9 ft. Flowers dirty yellow. Dry rocky situations. Hoching and Lichiang Valley. Alt. 8–10,000 ft. September 1904." G. Forrest. No. 624.

Allied to *P. ternifolius*, Don, but different by less tomentum, and the panicle being leafy to the top; even the uppermost leaf-like bracts are longer than the whorls of flowers. The leaves are shorter than those of the above species.

Plectranthus leucanthus, Diels. Sp. nov.

Caulis 25–50 cm. longus, parce pubescens, inferne et supra medium subaphyllus. Folia petiolo superne obcuneato-alato 1·5–3 cm. longo praedita, herbacea, glandulosa, supra praeterea pilosula, anguste ovata, dentata, petiolo excepto 4–5 cm. longa, 2–3 cm. lata. Inflorescentia paniculata vel racemosa e cymis composita, 5–20 cm. longa, puberula. Calyx circ. 2 mm. longus, demum apertus, ad basin barbato-pilosus, ceterum puberulus, dentes ovato-triangulares, inferi paulo longiores. Corolla alba, labium superius 4–fidum circ. 3 mm. longum, inferius roseo-maculatum 3 mm. longum.

"Hills of the Yangtse-Mekong divide at an elevation of from 6 to 10,000 ft. Moist woods. Flowers white, lower lobe of corolla spotted pink. September 1904." G. Forrest. No. 595.

Plectranthus megathyrsus, Diels. Sp. nov.

Planta 0·9–1·5 m. alta. Caules quadranguli, pilosi. Folia (superiora) petiolo obcuneato-alato circ. 2 cm. longo praedita; lamina late ovata, basi subtruncata, in utraque facie pilosa, dentata, 5–6 cm. longa, 4–5 cm. lata. Inflorescentia ampla, paniculata, ad 30 cm. longa, 20 cm. lata, rami e cymis demum divaricatis composita. Calyx pilosus, 4·5–5 mm. longus, demum auctus, dentes triangulares acuti. Corolla pallide coeruleo-

purpurascens ; tubus basi gibbus, 4–5 mm. longus, labium superius quadrifidum, 3–4 mm. longum, inferius 5 mm. longum.

" Plant of 3–5 ft. Flowers pale purplish blue. Western slopes of the Tsan shan Range, amongst grass and scrub. Lat. 25° 40′. Alt. 9–10,000 ft. September 1903." G. Forrest. No. 897.

The relation of this species seems to be with *Plectranthus amethystoides*, Benth. ; but it is a much larger plant in all parts, and much more hairy. It is also similar to *P. Forrestii*, Diels, but the calyx is smaller, with longer and more acute teeth, the corolla considerably smaller.

Coleus wulfenioides, Diels. Sp. nov.

Caules e rhizomate crasso erecti graciles circ. 25 cm. alti. Folia omnia basi appropinquata 4–5, subsessilia, praeter nervos hinc inde pilosos subglabra, obovata, basin versus sensim angustata, apice obtusa, margine crenato-serrata vel subintegra. Racemus e verticillastris 4–6 remotis compositus, bracteae parvae coloratae deflexae, late obovatae vel ovatae. Calyx 5–6 mm. longus, bilabiatus, labium superius amplum rotundatum 4 mm. longum, 3·5 mm. latum, inferioris dentes 2·5 mm. longi acuti, e basi triangulari rigide subulati, demum subspinescentes. Corolla purpurea puberula, tubus 7–8 mm. longus, labia limbi subaequalia 5 mm. longa superius 4–fidum. Calyx fructifer decurvus auctus, 7–8 mm. longus, limbo circ. 10 mm. lato.

" Common in pine woods, sides of Hoching and Lichiang valleys. Alt. 8–9000 ft. Flowers purple. September 1904." G. Forrest. No. 126.

In habit this is similar to *Orthosiphon scapigerum*, Benth., but the leaves are narrower, with shorter teeth, the corolla longer and more hairy, the upper lip more obtuse. An allied form was collected by Ducloux (No. 939).

Elsholtzia heterophylla, Diels. Sp. nov.

Caulis erectus, strictissimus, 0·3–0·8 m. altus, atropurpureus, hirtus, basi stolones repentes emittens. Folia stolonum parva, breviter petiolata, late elliptica vel subrotunda, leviter crenato-serrata, 0·4–0·6 cm. diamet., glabra. Folia caulina subcoriacea, glabra glandulis conspicuis ornata, subsessilia lanceolata vel oblonga, obsolete serrata vel serrato-crenata, 2–2·5 cm. longa, 0·5–0·7 cm. lata, costa et nervi primarii subtus conspicui. Spica unica terminalis ; bracteae dense imbricatae, latissimae, breviter cuspidatae vel obtusae, purpureo-venosae atque suffusae quasi pictae, ad 6–8 mm. latae. Calyx 3·5 mm. longus, dentes breves, pilosae. Corolla roseo-purpurea, valde lanuginosa, longius ex-

serta ; tubus elongatus limbum versus sensim ampliatus 10–12 mm. longus, stamina exserta.

" Erect plant of 1–2½ ft. Flowers rose purple. Moist boggy grass and bracken covered situations in the Ming Kwang valley north of Li-shih-tou-ho. Lat. 25° 30′. Alt. 6–7000 ft. October 1905." G. Forrest. No. 934.

The same plant has been collected in Yunnan by Maire (No. 1017) and by A. Henry (Nos. 9950, 9950a.).

It is allied to *E. Bodinieri*, but differs in its taller stems, more glabrous leaves and the stronger heterophylly of stem and stolons.

Elsholtzia luteola, Diels. Sp. nov.

Annua, simplex vel ramosa, 8–40 cm. alta. Caulis demum lutescens, seriebus longitudinalibus pilosis instructus. Folia glandulosa ceterum fere glabra, breviter petiolata vel sessilia e basi subcuneata sublanceolata, serrata, 2–3 cm. longa, 0·5–1 cm. lata. Rami fere omnes spicigeri. Spicae secundae, mensuris variabiles, maximae ad 5 cm. longae, 1 cm. latae. Flores arcte congesti, brevissime pedicellati. Bracteae imbricatae, latissimae, amplectentes, membranaceae, lateribus subhyalinae, late reniformes, longe cuspidatae, extus nervosae, pilosae, 5–6 mm. longae, 8–10 mm. latae. Calyx glandulosus, pilosusque, 2·5 mm. longus, dentes cuspidati. Corolla pallide lutea, exserta, 5–6·5 mm. longa, pilosula.

" Moist ground, sides of streams. Chung Tien plat. 12–13,000 ft. Flowers pale yellow. September 1904." G. Forrest. No. 625.

Allied to *E. cristata*, Willd., and very much like it in habit, but the bracts are sessile, the calyx larger, and the corolla yellowish.

Calamintha discolor, Diels. Sp. nov.

Caulis 0·2–0·4 m. longus, pilis retrorso-curvatis albido-cinereus, nonnisi parte infera ramosus. Foliorum petiolus 1–2 cm. longus, lamina membranacea, utrinque parce pilosula, subtus pallidior subglauca, anguste ovata vel lanceolata, basin versus subcuneato-angustata, serrata vel crenato-serrata, 3–7 cm. longa, 1·5–3 cm. lata. Verticillastri in axillis foliorum summorum, multiflori ; bracteae subulatae, longe pilosae, 5–7 mm. longae ; pedicelli graciles 2–5 mm. longi. Calycis tubus curvatus, 7 mm. longus, dentes circ. 3 mm. longi, superi triangulares, inferi mox subulati omnes acuti hirsuti. Corolla pallide rosea purpureo-venosa, et maculata, puberula 15–20 mm. longa, labia circ. 4–5 mm. longa.

" Plant of 9–14 inches. Flowers pale rose, spotted and veined a deeper shade. Grassy openings in, and on the margins of, pine forests in side valleys on the eastern flank of the Tali Range.

Lat. 25° 40′ N. Alt. 9–10,000 ft. June–July 1906." G. Forrest, No. 4527.

Apparently allied to *C. multicaulis*, Maxim., a Japanese species, but the leaves are longer and the flowers much larger.

Calamintha chinensis, Benth. in DC., Prodr. xii, p. 233. Ind. Flor. Sin. ii, p. 283 (Journ. Linn. Soc. xxvi, p. 283).

" Plant of 12–18 inches. Flowers pale rose-purple. Grassy situations amongst scrub on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–9000 ft. June 1906." G. Forrest. No. 4522.

A very small-flowered form.

var. **megalantha,** Diels. Var. nov.

Saepe purpurascens. Corollae tubus circ. 1 cm. longus, lobi circ. 3 mm. longi.

" Plant of 6–12 inches. Flowers rose-red. Amongst grass in willow scrub, margins of streams on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11,000 ft. June 1906." G. Forrest. No. 2476.

Salvia Bulleyana, Diels. Sp. nov.

Caules 30–45 cm. alti, superne pubescentes. Folia (inferiora) petiolo 4–5 cm. longo praedita, supra minute pilosula, subtus ad nervos pilosula ceterum glandulosa, e basi cordata vel excisa triangulari-ovata vel hastata, serrato-crenata, 4–7 cm. longa, 3·5–5 cm. lata. Racemus basi nonnunquam paniculatus ; bracteae late ovatae, subsessiles, coloratae ; verticillastri plerumque 4–flori. Calyx bilabiatus pilosus, 12–14 mm. longus, apice hians apertus, circ. 10 mm. latus, violaceo-suffusus et -nervosus. Corolla praecipue parte dorsali pubescens, purpurascenti-coerulea ; tubus basi angusta rectus circ. 12–14 mm. longus, deinde curvatus atque per 10 mm. sensim ad faucem 10–12 mm. latam ampliatus ; galea brevis circ. 7 mm. longa, labii inferioris lobi laterales 3 mm. longi, subtriangulares ; medianus 5 mm. longus circ. 8 mm. latus.

" Plant of 12–18 inches. Flowers purplish-blue. Rocky pasture on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 2100 to 2450 m. June 1906." G. Forrest. No. 4546.

The shape of the calyx and corolla is somewhat like that of *S. castanea*, Diels, but the foliage is very different, the lower leaves being cordate-ovate, the upper ones hastate.

Salvia castanea, Diels. Sp. nov.

Caules 0·4–0·6 m. alti, quadranguli, superne pubescentes. Folia pleraque in parte infera caulis orta, longissime (14–16 cm.) petiolata, supra pilosula, subtus cinereo-tomentella, nervis notata,

e basi rotundata vel leviter cordata elongato-ovata vel anguste triangularia, crenaturis parvis inaequalibus crenata, 10–13 cm. longa, 5–6 cm. lata. Folia caulina pauca. Racemus simplex vel basi ramis brevibus auctus, e verticillastris circ. 8 remotis compositus; bracteae violaceo-marginatae, pilosae, late obovatae vel ovatae. Flores 4–6–ni, patuli. Calyx bilabiatus, pilosus, atropurpureo suffusus, dorso 15–18 ventre 12–14 mm. longus, apice late hians 18 mm. latus. Corolla purpurascenti-castanea, basi rubescenti-lutea, praecipue ad galeam pubescens; tubus parte infera 15–18 cm. longa angustior dein parte supera 10 mm. longa curvatus atque faucem versus ad 12 mm. ampliatus; labii inferioris lobus medianus transverse ellipticus, 5 mm. longus 10–12 mm. latus.

"Plant of 1½–2 ft. Flowers purplish-maroon, base of corolla reddish-yellow. Shady grassy situations on the margins of pine forests on the eastern flank of the Lichiang Range. Lat. 27° 25′. Alt. 10–11,000 ft. September 1906." G. Forrest. No. 2938.

Allied to *S. hians*, Royle, but differing by the narrower leaves, the longer racemes, and the much narrower tube of the corolla.

Salvia digitaloides, Diels. Sp. nov.

Caules 0·3–0·6 m. alti, dense pubescentes. Folia pleraque basalia, petiolo 6–8 cm. longo praedita, in utraque facie molliter tomentella, supra saturate viridia, subtus alba, subrugulosa, oblongo-elliptica, crenata, 3·5–7 cm. longa, 2–3 cm. lata. Folia caulina pauca, superiora sessilia. Racemus e verticillastris 3–8 remotis compositus; verticillastri 4–6–flori; bracteae late ovatae vel obovatae, integrae, longe pilosae. Flores patuli vel subpenduli, breviter pedunculati. Calyx bilabiatus longe pilosus, laete viridis, violaceo-nervosus, 10–12 cm. longus, apice 10 cm. latus, labia latissime triangularia brevia. Corolla ochroleuca vel pallide lutea, violaceo-notata, praecipue dorso lanuginosa; tubus circ. 30 mm. longus e basi tubulosa sensim subcampanulato-ampliatus sub fauce 12–15 mm. latus; galea 8–10 mm. longa; labii inferioris lobus medianus transverse ellipticus, circ. 10 mm. latus. Staminum connectivum 5–7 mm. latum. Stylus apice introrsum decurvus.

"Plant of 1–2 ft. Flowers creamy yellow with pale violet markings. Shady dry situations in pine forest at the foot of the Sung Kwei valley. Lat. 26° 30′ N. Alt. 8–9000 ft. April 1906." G. Forrest. No. 2031.

This beautiful species is at once recognised by its soft velvety leaves, which are nearly all basal, and by its narrow bell-shaped flowers.

Salvia Forrèstii, Diels. Sp. nov.

Caules adscendentes, quadranguli, sublanuginosi, 30–75 cm. alti. Folia caulium fertilium infera minus robusta, longe petiolata caulina petiolo 5–7 cm. longo praedita, in utraque facie pilosula e basi cordata vel nonnunquam subhastata subpentagono-cordata vel late-ovata, 5–7 cm. longa, 5–7 cm. lata. Inflorescentia paniculata, parce lanuginosa et glutinosa, rami e verticillastris 2–4–floris compositi, bracteae late ovatae, apiculatae, conspicuae. Calyx pallidus, 16–18 cm. longus, 12 mm. latus, brevissime bilabiatus vel fere subtruncatus. Corolla intense aurantiaca, parce lanuginoso-pilosa ; tubus anguste campanulatus, 22–23 cm. longus, 10–12 cm. latus ; galea 10 mm. longa, 4 mm. lata, labium inferius quam galea vix longior, lobus medianus 8–10 mm. latus.

" Plant of 1–2½ ft. Flowers bright orange. Shady situations in mixed and pine forests on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 9–11,000 ft. August 1906." G. Forrest. No. 4548.

This is allied to *S. hylocharis*, but it is a much smaller plant. The lower lip of the corolla is about as long as the upper one.

Salvia flava, G. Forrest, ms. in schedis. Sp. nov.

Rhizoma suberectum robustum. Caules e basi adscendenti erecti, 20–50 cm. alti, praecipue superne ± pilosi. Folia basalia longe petiolata, in utraque facie sparse vel densius pilosula, subtus plerumque glandulosa, hastato-triangularia vel -ovata, crenata vel duplo-crenata vel crenato-serrata, 4–16 cm. longa, 2·5–8 cm. lata. Racemi e verticillastris 4–8 subremotis compositi, verticillastri plerumque 4–flori. Calyx pilosus, 10–12 mm. longus, apice 9–10 mm. latus, bilabiatus ; labium inferius bidentatum. Corolla flava, tubus e basi anguste tubulosa faucem versus ad 12 mm. dilatatus, pars angusta circ. 13 mm. longa, dilatata 10 mm. longa ; galea 10 mm. longa, parcius lanuginosa ; labii inferioris lobi laterales 3 mm. longi, 7 mm. lati, lobus medianus transverse ellipticus, emarginatus, violaceo-purpureo-maculatus, striatus vel punctatus, 7 mm. longus, 12 mm. latus.

" Plant of 9–18 inches. Flowers canary yellow with purple markings on upper lobe of corolla. Shady pine forests on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 10–11,000 ft. June 1906." G. Forrest. No. 2262.

" Plant of 1–1½ ft. Flowers yellow, blotched and veined deep purple. Dry open situations in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 8–9000 ft. June–July 1906." G. Forrest. No. 4545.

"Plant of 12–18 inches. Flowers bright yellow. Dry, shady pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–11,000 ft. July–August 1906." G. Forrest. No. 4547.

var. **megalantha,** Diels.

Calyx 13–15 mm. longus. Corollae tubi pars angustior 15–17 mm. longa, dilatata 12 mm. longa, apice 15 mm. lata. Labii inferioris lobus medianus 18 mm. latus conspicue fusco- vel purpureo-maculatus.

"Plant of 15 inches. Flowers canary yellow, lower lobe of corolla marked reddish-brown. Open mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 20′. Alt. 11–12,000 ft. July 1906." G. Forrest. No. 2548.

"Plant of 2–3 ft. Flowers deep yellow with purple blotch in lower lobe of corolla. Pass between Teng Chuan and Sung Kwei valleys. Moist places on edge of woods. Alt. 2400 to 3050 m. September 1904." G. Forrest. No. 602.

The plant is variable in size and hairiness of the leaves and stem, as well as in size and marking of the flower.

Salvia hylocharis, Diels. Sp. nov.

Caulis quadrangulus, superne sublanuginosus, 45–90 cm. altus. Foliorum superiorum petiolus sublanuginosus 4–10 cm. longus, lamina in utraque facie parcius pilosula, latissime cordata, margine calloso-crenata, 14–16 cm. longa et lata. Panicula ampla pyramidalis, rami e verticillastris 2–4-floris laxius compositi; bracteae late obovatae integrae, ciliatae. Calyx parcius praecipue ad margines lanuginosus vel glabratus, amplus, pallidus, 20–25 mm. longus, apice 14 mm. latus, brevissime bilabiatus vel potius labiis latissimis emarginato-subtruncatus. Corollae intense flavae tubus e basi ipsa angusta sensim et aequaliter ampliatus et dilatatus, 25–26 mm. longus, sub fauce 14 mm. latus, praeter galeam lanuginosulam fere glaber; galea brevis 10 mm. longa; labii inferioris quam galea longioris lobi laterales 14 mm. longi, 14 mm. lati, lobus medianus violaceo-notatus, subreniformis, 7 mm. longus, 14 mm. latus. Staminum filamentum 8 mm. longum, pars antherifera quam sterilis duplo longior 8 mm. longa.

"Plant of 1½–3 ft. Flowers rich yellow, lower lobe of corolla marked violet. Open situations in dense pine forests on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 10–11,000 ft. June 1906." G. Forrest. No. 2394.

This is one of the most magnificent species of the genus. The leaves are very similar to those of *Ligularia*.

Salvia trijuga, Diels. Sp. nov.

Perennis 0·3–0·6 m. alta. Caulis pilosus. Folia ternata, in utraque facie pilosa, inferiora longe (5–7 cm.) petiolata, foliola (terminale longius) petiolulata; foliola e basi subcordata vel truncata ovata vel elliptica, crenata, obtusa, superiora trifida, suprema integra; foliorum inferiorum foliola lateralia 4 cm. longa, 2·8 cm. lata, terminale 5–6 cm. longum, 4–5 cm. latum petiolulo 2·5–3 cm. longo praeditum. Inflorescentia paniculata, ampla; rami angulo acuto erecti; verticillastri pauci-, saepe 1–2–flori; bracteae parvae, coloratae, anguste ovatae. Flores breviter pedicellati pedicello circ. 3 mm. longo. Calyx glanduloso-pubescens ± violaceo-suffusus, bilabiatus, 10–11 cm. longus, limbo 8–9 cm. latus; labium inaequaliter 3–dentatum, inferius bidentatum. Corolla varie purpurascens vel coeruleo-rosea, luteolo-maculata; tubus circ. 20 mm. longus, antrorsum sensim ad 9–10 mm. ampliatus; galea paulum porrecta, puberula, 9 mm. longa, labii inferioris lobi laterales breviter late falcati, 5 mm. longi, lobus medianus transverse ellipticus vel subrotundus, 5 mm. longus, 10 mm. latus. Staminum connectivum circ. 8 mm. longum.

"Teng Chuan and Sung Kwei valleys, generally in woods or shady places. Alt. 7–10,000 ft. September 1904." G. Forrest. No. 65.

"Plant of 1–2 ft. Flowers rose lavender and pale yellow. Dry, chalky pasture on the margins of pine forests on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 10–11,000 ft. August 1906." G. Forrest. No. 2813.

Nepeta Stewartiana, Diels. Sp. nov.

Caulis 0·6–1·5 m. altus, ramosus, quadrangulus, minute pubescens. Folia infima ante tempus florendi marcescentia, media petiolata petiolo 1–1·5 cm. longo, herbacea, minutissime pilosula et glandulosa, oblonga vel lanceolata, serrata, 6–10 cm. longa, 2–2·5 cm. lata, superiora decrescentia. Panicula bracteis foliaceis ornata, verticillastri breviter pedunculati vel subsessiles, remoti; bracteolae lineari-lanceolatae. Calyx cylindricus, pilosus, saepe violascens, 10–14 mm. longus, dentes 3 superiores altius connati, apices liberi triangulares circ. 1·5 mm. longi, 2 inferiores lanceolati acutissimi 5 mm. longi. Corolla coerulea vel violacea, intensius maculata striataque, parce puberula vel fere glabra; tubus curvatus longe exsertus, 20–25 mm. longus, sub limbo 10 mm. latus, lobi labii superi circ. 4 mm. lati, lobi laterales inferi 3 mm. longi, 4 mm. lati, medianus transverse ellipticus, emarginatus, 5–6 mm. longus, 9–10 mm. latus, ad palatum barbatus.

"Plant of 3–5 ft. Flowers deep purplish-blue. Valley of the Sung Kwei. Alt. 8–10,000 ft. September 1904." G. Forrest. No. 598.

"Plant of 2–3 ft. Flowers blue, stripped and spotted a darker shade, whole plant aromatic. Grassy openings in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 2960.

This showy species is allied to *N. Souliei*, Léveillé, but differs in its more glabrous leaves, and much longer calyx. Both belong to the group of *N. macrantha*, Fisch.

Nepeta tenuiflora, Diels. Sp. nov.

Caulis 0·3–1 m. altus, quadrangulus, pilosulus, ramosus. Foliorum (mediorum) petiolus 2–2·5 cm. longus; lamina pilosula et glandulosa, herbacea, subtus pallidior, e basi subtruncata, lanceolata, acuta, serrata serraturis obliquis minute callosis, 10 cm. longa, 3 cm. lata, superiora decrescentia. Inflorescentiae terminales parvae, verticillastri breviter pedunculati. Calyx glandulosus, dentes 3 superi 8 mm. longi, alte connati, apices liberi triangulares 1·5 mm. longi, 2 inferi 5–6 mm. longi, apices liberi 2 mm. longi. Corolla erecta subcurvata coerulea, gracilis, 12–16 mm. longa, labium superum circ. 4 mm. longum, inferum vix majus, lobus medianus obovatus, crispulus, 3 mm. longus.

"Plant of 1–3 ft. Flowers blue; whole plant strongly aromatic. Open grassy situations in and on the margins of pine forests on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 9500–11,000 ft. August 1906." G. Forrest. No. 2657.

Easily recognised by its small narrow flower.

Dracocephalum bullatum, Forrest, ms. in schedis. Sp. nov.

Rhizoma radicibus fibrosis robustis elongatis praeditum. Caules adscendentes, 7–25 cm. longi, purpurascentes, cinereo-pilosi. Folia basalia et inferiora longe petiolata petiolo ad 4 cm. longo, lamina subcoriacea, mox glabra, subtus pallida purpurascentia, e basi cordata ovato-elliptica, crenata, ad 5 cm. longa, 4 cm. lata, superiora multo minora subsessilia, omnium nervi subtus elevati conspicui. Racemus densiflorus, 6–8 cm. longus. Bracteae pallidiores, inferiores amplae, imbricantes, subtus ± purpurascentes vel purpureo-nervosae, pilosae, praecipue ad marginem ciliatae. Calyx 1·5-2 cm. longus, pilosus, segmentum superius obtusum late ellipticum saepe violascens, 4 inferiora triangularia vel lanceolata acuta 0·5–0·6 cm. longa. Corolla 3–3·5 cm. longa, saturate coerulea, extus pubescens; tubus e basi anguste sensim ad 1–1·2 cm. dilatatus, labium superius 1·2 cm. latum, 0·5–0·6 cm. longum, bilobum, labium inferius

minute intensius maculatum, lobo mediano producto 0·8 cm. lato ornatum. Stamina inclusa, filamentum pilosum.

"Plant of 3–7 inches. Flowers bright blue, lower lobe of corolla minutely marked a deeper shade. Open situations on limestone drift at base of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11,000 ft. Flow. August 1906." G. Forrest. No. 2730.

This fine species is related to the Himalayan *Dracocephalum speciosum*, Benth., and *D. nutans*, L.; the large bracts and flowers are very showy.

Scutellaria Forrestii, Diels. Sp. nov.

Rhizoma repens, caules erectos emittens. Caulis quadrangulus, patenti-pilosus, 15–20 cm. altus. Folia inferiora minuta, superiora petiolo 2·3 mm. longo praedita, in utraque facie pilosa, supra viridia subtus purpurascentia vel violascentia, late ovata, crenato-serrata apice obtusa, 2·5 cm. longa, 2 cm. lata. Bracteae calycem longe superantes, inferiores foliaceae superiores decrescentes subintegrae. Flores subsessiles conspicui. Calyx parvus circ. 3 mm. longus, circ. 5 mm. latus, pilosus. Corolla intense et saturate coerulea extus pilosa, basi curvata; tubus 2·5–3 cm. longus, labium superius breviter emarginatum, labii inferioris lobi laterales superiori longe adnati atque quasi ei pertinentes; lobus medianus amplissimus 1·2 cm. longus et latus, subrotundus.

"Plant of 6–8 inches. Flowers deep rich blue. On ledges and in clefts of limestone cliffs on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 10–11,000 ft. Flow. June 1906." G. Forrest. No. 2281.

A very beautiful species of the affinity of the Himalayan *Scutellaria angulosa*, Benth.

Scutellaria likiangensis, Diels. Sp. nov.

Pluricaulis, caules adscendentes, fusco-purpurei, 4–anguli, lateribus alteris densius pilosi, 0·3–0·5 m. longi, simplices vel apice ramis 1–2 aucti. Folia sessilia, inferiora minora, oblongo-elliptica, utrinque acuta, breviter crenato-serrata vel subintegra, nervis hinc inde pilosula ceterum glaberrima, sensim in bracteas transeuntia. Bracteae anguste oblongae, vel breviter ovatae, integrae, (cum rhachi) densius glanduloso-pubescentes, saepe purpurascentes calycem superantes. Flores in spicam bracteatam angustam collecti, bini oppositi. Pedicelli perbreves. Calyx 3–4 mm. longus, dense pubescens, purpurascens, dentes breves; corolla viridulo-lutea purpureo-suffusa vel -venosa, puberula, tubus circ. 2 cm. longus, labia 5–6 mm. longa.

"Plant of 1–1½ ft. Flowers greenish-yellow, veined and marked pale purple. Open dry situations amongst scrub, also

in pine forests along the base of the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 9–10,000 ft. June 1906." G. Forrest. No. 2424.

Related in several characters to *S. angulosa*, Benth., but different in habit, shape of leaves, and colour of the flower.

Chelonopsis odontochila, Diels. Sp. nov.

Fruticosa 1·8–3 m. alta. Ramuli puberuli. Foliorum petiolus pubescens, 2–3 cm. longus; lamina herbacea, utrinque pilosa, obsolete rugulosa, ovata, subacuminata, serrata vel crenato-serrata, 4·5–6 cm. longa, 3–4 cm. lata. Flores axillares, singuli vel terni, pedunculo 1–2 cm. longo bibracteolato suffulti. Calyx campanulatus, 10–12 mm. longus, deinde ampliatus siccus, dentes subtriangulares, apiculati, 2–4 mm. longi, subaequales. Corolla flava, pubescens, 30–35 mm. longa, ad 12 mm. lata; limbus parvus, labium superius circ. 3 mm. longum, inferioris lobi laterales circ. 3 mm. diamet., medianus major margine conspicue dentatus.

"Shrubby plant of 6–10 ft. Flowers yellow. Valley of the Yangtse between Tzuko and Chinho. Alt. 6–7500 ft. October 1904." G. Forrest. Nos. 22, 600.

Markedly different from *C. moschata*, Miq., in leaves, calyx, and corolla.

Colquhounia decora, Diels. Sp. nov.

Frutex semi-scandens 1·8–3 m. longus. Rami graciles puberuli, internodia elongata. Folia petiolata, petiolo 1–2·5 cm. longo, herbacea, dense glandulosa et pilis simplicibus paucissime puberula, subtus pallidiora, anguste ovata, longe acuminata, serrata serraturis subcallosis, 3·5–5 cm. longa, 2–2·5 cm. lata, nervi parum conspicui. Cymulae axillares, breviter pedunculatae, pauciflorae; pedunculi stricti, 0·5–1 cm. longi; pedicelli 2–3 mm. longi. Calyx oblique infundibuliformis, pubescens, 5 mm. longus, sub limbo 4–5 mm. latus, dentes triangulares 3 mm. longi; post anthesin ampliatus subcoriaceus. Corolla coccinea, extus puberula; tubus e basi angusta mox ampliata, 13 mm. longus; labium superum concavum, ellipticum, apice obtusum, circ. 7 mm. longum, inferum reflexum tripartitum, segmenta lateralia 7 mm., medium protractum angustum, 5 mm. longum. Stamina 6 mm. exserta. Styli rami inaequales.

"Semi-climbing shrub of 6–10 ft. Edges of cane brakes on hills west of Yunnanfu. Alt. 7–8000 ft. February 1903. Flowers dull Indian red." G. Forrest. No. 327A.

Allied to *C. elegans*, Wall.; but much more glabrous, the calyx is larger and much broader, the tube of the corolla remarkably short, the petiole is larger, the leaves more acuminate

and more deeply serrate. A form of Central China (Henry, No. 3334), *C. elegans*, Wall., *B. pauciflora*, Prain, which has much smaller flowers, seems quite different. Nearer is the plant collected by Henry (No. 9089a) near Mengtze, but more hairy and differing in the leaves.

Phlomis betonicoides, Diels. Sp. nov.

Caules 0·3–0·8 m. alti erecti quadranguli dense hispidi. Folia basalia 6–12 cm. longe petiolata, lamina mollis, subtus stellato-supra potius hispido-pilosissima, subrugulosa, e basi cordata anguste ovata, crenato-dentata, obtusa, 8–10 cm. longa, 5–6 cm. lata, nervi subtus prominentes. Folia caulina 1–3–na, superiora sessilia lanceolata, dentata ; bracteantia patentia 5·6 cm. longa. Verticillastri densi multiflori ; bracteae bracteolaeque subulatae, sursum curvatae, subrigidae, atropurpureae, 4–8 mm. longae. Calyx praecipue antrorsum hispidulus, 10 mm. longus, inter dentes circ. 1·5–2 mm. longos rigidiusculos bidentulatus. Corolla rosea, extus stellato-hispidula ; galea intus barbata, 7 mm. longa ; labii inferioris lobi laterales subtriangulares subintegri, medianus paulo latior obovato-ellipticus.

" Plant of 1–2½ ft. Flowers rose-pink. Stony, barren but cultivated ground on plain at north end of the Lichiang valley. Lat. 27° 10′ N. Alt. 9000 ft. June 1906." G. Forrest. No. 2307.

Phlomis Forrestii, Diels. Sp. nov.

Caules 0·3–0·9 m. alti, quadranguli, praecipue in sulcis stellato-pubescentes. Folia (superiora) petiolo 2–2·5 cm. longo praedita ; lamina herbacea, supra parce hispida, subtus stellato-pubescens pallidior, subovata, serrata, acuminata, 6–8 cm. longa 3·5–4 cm. lata. Verticillastri 4–7–flori, bracteae spinescentes calyce dimidio breviores. Calyx minute stellato-pilosulus, conspicue nervosus, circ. 8 mm. longus, dentes rigidi apice spinescentes, 1·5 mm. longi. Corollae livide purpureae tubus 10–11 mm. longus ; limbus extus stellato-tomentellus, galea 8 mm. longa, intus barbata, margine inciso-denticulata, labii inferioris 8 mm. longi lobus medianus 5–6 mm. latus cum lateralibus dimidio angustioribus margine inciso-denticulatus.

" Plant of 2–3 ft. Flowers dull livid crimson. Amongst scrub in and on the margins of pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–11,000 ft. August 1906." G. Forrest. No. 4558A.

This is allied to *Phlomis melanantha*, Diels, but the calyx is minutely stellato-puberulous almost papillose, not hairy, and has much shorter teeth. The corolla is smaller, and of a dull livid crimson colour.

Phlomis Franchetiana, Diels. Sp. nov.

Caules 0·6–0·9 m. alti, stellato-pubescentes. Folia media 6 cm. longe petiolata, lamina herbacea, in utraque facie pilis stellatis scabra, subtus pallidior, e basi altius cordata, late ovata, crenato-dentata, apice acuminata, 10–12 cm. longa, 6–9 cm. lata. Verticillastri 4–6–flori; bracteolae brevissimae, 1·5 mm. longae. Calyx extus stellato-pubescens, circ. 8 mm. longus, dentes 1–1·5 mm. longi. Corolla livide purpurea, extus stellato-tomentella, galea intus barbata, 6 mm. longa margine inciso-denticulata, labii inferioris lobi margine obsolete eroso-denticulati, lobus medianus quam laterales vix latior sed fere dimidio longior, concavus, circ. 5–6 mm. longus.

"Plant of 2–3 ft. Flowers dull livid crimson. Amongst scrub in and on the margins of pine forests on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 9–11,000 ft. August 1905." G. Forrest. No. 4558.

From *P. Forrestii,* Diels, distinguished by shorter bracteoles, smaller corolla, the proportions of the lower lip and the stellate tomentum of the leaves which are more crenate.

Phlomis melanantha, Diels. Sp. nov.

Caules 0·6–0·9 m. alti, quadranguli, fere glabri. Folia caulina inferiora minora, mediorum petiolus atropurpureus, parce hispidus 5–6 cm. longus; lamina herbacea, supra parce strigoso-hispida, subtus pallidior et magis glabra, cordata vel cordato-ovata, dentata vel serrato-dentata, apice longius acuminata, 6–8 cm. longa, 3·5–6·5 cm. lata. Verticillastri axillares densiflori, bracteae et bracteolae lineares calycem aequantes vel paulo superantes, apice subspinescentes. Calyx purpurascens, circ. 8 mm. longus, ad nervos et dentes hinc inde hispidus, dentes rigidi spinescentes, 4 mm. longi, erecti. Corolla atropurpurea; tubus circ. 10 mm. longus; limbi segmenta conspicue inciso-dentata, extus sericeo-pilosa; galea intus longe albo-barbata, 10 mm. longa; labii inferioris 7 mm. longi lobus medianus 5–6 mm. latus, quam laterales subduplo latior.

"Plant of 2–3 ft. Flowers deep almost black crimson. Open grassy situations amongst scrub on the margins of pine forests on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 10–11,000 ft. July 1906." G. Forrest. No. 2540.

The sharply-toothed lobes of the deep crimson, "almost black" (ex G. Forrest) corolla are remarkable.

Ajuga Forrestii, Diels. Sp. nov.

Caulis 15–50 cm. longus, adscendens vel erectus, ima basi hypophyllis squamiformibus vestitus, villosus; stolones nulli.

Folia inferiora saepe breviter petiolata, cetera sessilia, herbacea, utrinque pilosa, oblonga vel lanceolato-oblonga, leviter crenato-dentata, obtusa, 5–8 cm. longa, 1·5–2·6 cm. lata. Verticillastri in spicam bracteatam densam conferti. Bracteae ovatae, subintegrae, ± coeruleae, flores longe superantes 2–3 cm. longae, 0·7–1·2 cm. latae. Calyx infundibuliformis, basi glabrescens, ceterum pilosus, intense coeruleus, tubus 3–4 mm. longus, dentes triangulares 5–6 mm. longi, 1·5–2 mm. lati. Corolla pallide coerulea, tubus rectus, pubescens, 8–10 mm. longus, lobi laterales 3 mm., medianus emarginatus, 4–5 mm. longus. Stamina breviter exserta.

"Plant of 6–12 inches. Flowers pale blue. Dry, stony situations on cultivated patches on plain at the north end of the Lichiang valley. Lat 27° 10′ N. Alt. 8500–9000 ft. May 1906." G. Forrest. No. 2133.

This showy species is recognised by the narrow leaves and the dense spike with coloured bracts much longer than the flowers. It is allied to *A. bracteosa*, Wall., but I have not seen any form matching it.

Ajuga lupulina, Maxim. var. **major** Diels. Var. nov.

"Plant of 3–9 inches. Flowers watery white, veined and streaked bright blue. Open mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 10–11,000 ft. June 1906." G. Forrest. No. 2448.

This is a remarkable form of the species, much stronger and larger than the type or any form previously found, the leaves and bracts being much broader, some of them fully 8 cm. long and 3·5 cm. broad.

Ajuga campylantha, Diels. Sp. nov.

Planta semidecumbens, basi plerumque stolones emittens. Caulis 7–25 cm. altus, dense flavido- vel albido-pilosus. Folia in petiolum brevem angustata, herbacea, utrinque dense hispidulo-pilosula, oblonga-ovata vel elliptica, basi integra, ceterum leviter repando-serrata vel -crenata, 3–5 cm. longa, 1·5–2·5 cm. lata, floralia densius vestita, verticillastros superantes. Calycis dense pilosi dentes triangulares tubo aequilongi; calyx 5-6 cm. longus. Corollae albidae atropurpureo-venosae papilloso-pubescentis tubus curvatus 12–15 mm. longus, labium inferum 7 mm. longum, lobus medianus 4–5 mm. latus, labium superum 3–4 mm. longum. Stamina corollam aequantia vix exserta. **Stylus apice brevissime bifidus.**

"Semi-procumbent plant of 3–9 inches. Corolla white, veined purplish-black. Dry, stony pastureland on the northern end of the Lichiang plain. Lat. 27° N. Alt. 8500 ft. August 1906." G. Forrest. No. 2700.

Easily recognised from the other stoloniferous species by the curvate tube of the corolla and hardly exserted stamens.

LAURACEAE.

Machilus mekongensis, Diels. Sp. nov.

Frutex ? Rami glabri. Folia petiolo 1–2 cm. longo praedita, lamina papyracea, glabra subtus glauca, late ovata vel obovata, obtuse acuminata, 6–9 cm. longa, 3·5–4·5 cm. lata, nervi rufo-colorati utrinque circ. 3–4 angulo acuto adscendentes subtus tenuissime prominuli ; nervuli minutissime reticulati. Paniculae cum pedunculo 3–6 cm. longo 6–10 cm. longae, 2·5–3 cm. latae, ramuli utrinque 2–4 patentes, cymosi, plerumque triflori ; pedicelli 2–3 mm. longi. Flores ± pubescentes, ca. 3 mm. longi. Perianthii segmenta carnosula, triangulari–ovata, 1·6–2 mm. longa, 1·2 mm. lata. Staminodia exteriora 6 subspathulata, interiora 3 biglandulosa, intima 3 minuta, lanceolato-clavata pilosa.

" Shupa valley. Shrubby hillsides. Alt. 11,000 ft. Yangtse-Mekong divide, Tibet. 1904." G. Forrest. No. 370.

" Mekong-Salwin divide behind Tsekou mission, Tibet. 1904." G. Forrest. No. 372.

Litsea Forrestii, Diels. Sp. nov.

Frutex 1·8–3 m. altus. Rami graciles rufo- vel fusco- corticati, tempore florendi efoliati foliaque novella subgignentia. Umbellae ex axillis foliorum pristinorum delapsorum longe pedunculatae, pedunculis 1·5–3·5 longis. Involucri phylla lata, subrotunda, extima 2 scariosa fusca pallidius marginata, 0·5–0·6 cm. longa ; interiora pallida, mox decidua ; pedicelli albo-sericei, 2·5–3 mm. longi. Flores ♂ in umbella 8–12, basi sericei, flavi. Perianthii segmenta 5–6 late elliptica, concava, trinervia, intus glabra, 3·5 mm. longa, 3 mm. lata. Stamina 6 exteriora 2·5 mm. longa, 3 interiora biglandulosa 2 mm. longa.

" Shrub of 6–10 ft. Moist, shady hillside. South end of Chao Cheo valley. Alt. 7000 ft. March 1905." G. Forrest. No. 374.

This graceful species belongs to the group of *L. sericea ;* it is easily recognised by the long peduncles of the inflorescences.

LEGUMINOSAE.

Astragalus coelestis, Diels. Sp. nov.

Caulis fere omnino hypogaeus, gracilis, apice hypophyllis squamiformibus praeditus. Stipulae amplae, late ellipticae,

obtusae, scariosae, circ. 5 mm. longae 3–4 mm. latae ; petiolus pubescens, 3–5 cm. longus; foliola 2–3–juga brevissime petiolulata, glaucoviridia, supra glabra subtus primo dense demum parce pubescens, obovata vel late elliptica, apice nonnunquam emarginata, circ. 1 cm longa, 6–9 mm. lata. Scapus (an semper ?) singulus, 5–10 cm. longus, pubescens, 1–4-florus. Calyx campanulatus, extus nigro-pilosus, bilabiatus, labio supero brevissime bidentato, infero 3–dentato, 3–5 mm. longus. Corolla intense coerulea ; vexillum orbiculare, apice conspicue emarginatum, 9–10 mm. diamet. ; alae 10–11 mm. longae, 3–3·5 mm. latae ; carina brevissima, 5 mm. longa, 2 mm. alta. Stylus sursum curvatus brevissimus.

" Plant of 2–4 inches. Flowers bright blue. Dry mountain pastureland on the eastern flank of the Lichiang Range. Lat. 27° 10′. Alt. 9–11,000 ft. May 1906." G. Forrest. No. 2221.

A bright-blue flowering herb, the smallest of the Yunnan species of the genus.

Astragalus dolichochaete, Diels. Sp. nov.

Caules procumbentes, pilis nigris conspersi, 0·3–0·6 m. longi. Stipulae anguste triangulatae, acutae, 4–6 mm. longae. Folia 8–10 cm. longa, 2·5–3 mm. lata, herbacea, foliola 7–9–juga, breviter petiolulata, subelliptica, mucronulata, supra glabra, subtus glauco-pallidiora pilis albis minutis vestita, 1–1·2 cm. longa, 0·3-0·6 cm. lata. Racemi axillares et terminales, longissime (6–10 cm.) pedunculati ; bracteae lineari-subulatae, 7–8 mm. longae ; pedicelli brevissimi. Calyx pallide viridis pilis nigris conspersus, tubus circ. 4 mm. longus, dentes longissimi aristiformes, 8–10 mm. longi. Corolla sulphurea, apice purpurascens ; vexillum suborbiculare, apice emarginatum, 15 mm. diamet. ; alae 13 mm. longae, 3–4 mm. latae, carina 12–13 mm. longa, circ. 5 mm. lata ; stylus sub stigmate pilis paucis praeditus.

" Procumbent plant of 1–2 ft. Flowers pale lemon yellow, tipped purple. Open mountain pastureland on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 9–11,000 ft. July 1906." G. Forrest. No. 2608.

Belongs to the Subgen. *Phaca ;* it is easily recognised by the long awn-like teeth of the calyx.

Indigofera leptosepala, Diels. Sp. nov.

Fruticulus humilis ramosus. Ramuli novelli pilis fuscis patulis villosula. Folia subsessilia, 4–5–juga, rhachis eodem modo villosula ; foliola herbacea, pilis longis albidis adpressis pilosa subtus glauca, obovata vel elliptica conspicue mucronulata, 0·6–1·5 cm. longa, 0·4–0·9 cm. lata. Stipulae angustissime lanceo-

latae subulatae, villosulae, ad 5 mm. longae. Racemi breviter pedunculati 5–12-flori, fusco-villosulae. Flores pedicellati. Calyx fusco-villosulus, tubus dilatatus, circ. 2 mm. longus, dentes longi subulati, ad 4 mm. longi. Corolla pallide rosea dense pubescens, 10–12 mm. longa, vexillum ca. 8 mm. latum, carina 3 mm. alta, alae basi breviter plicato-calcaratae 4 mm. latae.

"Dwarf shrub of 1–2 ft. Flowers pale rose. Dry open situations amongst scrub on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 10–11,000 ft. July 1906." G. Forrest. No. 2651.

In habit not unlike to *I. hirsuta*, L., but the leaflets are much smaller and fewer, the racemes loose, the flowers much larger. The nearest of the Yunnan species is *I. chaetodonta*, Franch., which has a very similar calyx, but a different corolla, and is "pilis strigosis semiadnatis haud dense vestita" (Franchet, Plant. Delavay., 155).

Millettia Harrowiana, Diels. Sp. nov.

Rami adulti, albo-lenticellati. Folia in tempore florendi nondum matura tenuia, 4–5–juga, foliola opposita petiolulata, glabra, oblongo-elliptica, vel rarius anguste subovata, basi subinaequilateralia, apice breviter acuminata acumine saepe recurvo, 4·5–5·5 cm. longa, 1·5–2·5 cm. lata. Racemi infra folia orti cum pedunculo 12–16 cm. longi; pedicelli 2–3 fasciculati, 2–3 mm. longi, apice bibracteolati, cum calyce campaniformi breviter dentato circ. 5 mm. longo ferrugineo-sericeo-velutino. Corolla pallido-rosea circ. 7 mm. e calyce progressa. Androecium 7–8 mm. longum. Ovarium sericeum.

"Shrub of 10–20 ft. Flowers pale-creamy-rose. Dry, open situations along the base of the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. August 1906. W. Yunnan, China." G. Forrest. No. 1874.

Closely allied to *M. scabricaulis*, Franch., of the Tapintze district east of Tali, but the leaves are softer at the time of flowering, and somewhat smaller, the calyx longer, the corolla smaller and of a paler colour.

Vicia dichroantha, Diels. Sp. nov.

Herba scandens, 1·8–3 m. alta. Caules superne sulcati, puberuli. Folia sessilia 10–15 cm. longa; stipulae ab insertione utrinque productae, deorsum basi obtusae, margine repando-crenatae, sursum semi-ovatae, apice acute acuminatae, 15–18 mm. longae, 3–4 mm. latae; foliola 8–10, brevissime petiolulata, opposita vel alterna, supra punctulata, subtus glauca pilosa, linearia vel lanceolato-linearia, apice obtusa apiculata, 5–8 cm. longa, 5–8 mm. lata. Racemi axillares longe pedunculati, pedun-

culus 8–12 cm. longus, ipsi 5–6 cm. longi, novelli dense pilosi; pedicelli pilosuli breves; flores patuli vel penduli. Calyx submembranaceus, pallidus, pilosus, limbo obliquus, 4–5·5 mm. longus, dentes e basi lata acutissimi fere subulati, superi quam inferi breviores. Corolla "luride aurantiaca," vexillum apice purpureum late obovatum, apice emarginatum, 12 mm. longum, circ. 8 mm. latum; alae 12 mm. longae, 2·5 mm. latae, carina 10–12 mm. longa, 4 mm. alta.

"Scandent plant of 6–10 ft. Flowers dull orange, vexillum tipped purple. On scrub in dense thickets on the eastern flank of the Lichiang Range. Lat. 27° 12′. Alt. 9500 ft. June 1906." G. Forrest. No. 2443.

A fine species of the Sect. *Cracca*, allied to *V. tenera*, Grah., of the Western Himalaya, but different by its stipules, the more obtuse leaflets, the hairy calyx and larger corolla. From *V. tenera*, var. *yunnanensis*, Franch. (probably a distinct species), it is separated by the nearly subulate sepals. I have not seen Franchet's plant.

Dumasia Forrestii, Diels. Sp. nov.

Caulis scandens, pilis nigris parce conspersus ceterum glaber. Folia subchartacea, inferiora petiolo ad 8 cm. longo praedita, foliola stipellata petiolulata, laete viridia, praeter pilos illos paucos glabra, late ovata, apice retusa vel emarginata mucronulata, terminale 4–4·5 cm. longum, 3·5–4 cm. latum, lateralia ca. 4 cm. longa, 3–3·5 cm. lata; stipulae lanceolatae nervoso-striatae saepe purpurascentes, circ. 5–6 mm. longae. Folia superiora brevius petiolata minora. Racemi axillares pedunculo ipsis longiore 2·5–3·5 cm. longo praediti. Flores conferti. Bractea bracteolaeque stipulis simillimae flori subsessili dense appropinquatae, persistentes, 6–7 mm. longae, 2·5 mm. latae. Calyx pallide viridis circ. 10 mm. longus, 5 mm. latus ore oblique truncatus. Corolla pallide lutea, ca. 15–16 mm. longa. Vexillum calcaratum. Stylus ad curvaturam complanatus.

"Amongst scrub in the Mekong and Wei Hsi valleys. Lat. 27° 28′ N. Alt. 7–9000 ft. October 1904." G. Forrest. No. 1124.

A very distinct species, remarkable by its nearly glabrous retuse leaflets, and the large conspicuous bracts and bractlets persisting close to the gibbous base of the calyx.

Mucuna montana, Diels. Sp. nov.

Caulis debilis scandens, 0·4–1·5 m. altus, cinereo-pilosus. Folia longe petiolata, stipulae mox deciduae vel obsoletae; petiolus 10–12 cm. longus, cinereo-pilosus; foliola herbacea, in utraque facie pilosa, subtus pallidiora, cinerea, petioluli

subferrugineo-pilosi. Foliolum intermedium longius (1·5–2·5 cm.) petiolulatum, transverse-subrhombeum, apice cuspidulatum, 6–7 cm. longum, 6·5–8 cm. latum ; foliola lateralia inaequilateralia latere basiscopo latiore, subpentagono-elliptica, 6–8 cm. longa, 5·5–6 cm. lata. Racemi quam petiolus breviores, 5–8 cm. longi, pedunculus tenuis gracilis. Flores 5–10. Calyx pilosus, tubus 5–6 mm. longus et latus, dentes superi triangulares vel late lanceolati, 5–6 mm. longi, inferus longior, concavus, acutus. Corolla carnosa, rosea purpureaque ; vexillum late ellipticum, apice excisum, 22 mm. longum, circ. 19 mm. latum ; alae circ. 25 mm. longae, basi appendiculo calcariformi praeditae ; carina circ. 25 mm. longa, apice involuto-recurva.

" Weakly scandent plant of 1½–5 ft. Corolla fleshy, pink and carmine. Dry, stony situations amongst scrub on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 9–10,000 ft. July 1906." G. Forrest. No. 2697.

A very distinct species.

LOGANIACEAE.

Buddleia adenantha, Diels. Sp. nov.

Frutex 1·2–2·5 m. altus. Folia superiora subsessilia, supra praeter nervos glabrescentia, subrugulosa, subtus crasse albo-tomentella, lanceolata, breviter serrulata, utrinque angustata, apice acuminata, 5–6 cm. longa, 1–1·5 cm. lata. Thyrsi elongati angusti e cymis sessilibus compositi, 5–6 cm. longi, 1–1·2 cm. lati. Calyx tomentellus 3·5 mm. longus, lobi triangulares acuti. Corolla cinereo-purpurascens fragrans extus praeter pilos stellatos sparsos glandulis amplis densissime vestita, tubus 5 mm. longus, intus dense pilosus, limbus brevis, lobi late ovati. Gynaeceum 3 mm. longum, ovarium superne densius stellato-pilosum.

" Shrub of 4–8 ft. Flowers greyish-purple, fragrant. Amongst scrub on the margins of pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–11,000 ft. Flow. June–August 1906." G. Forrest. No. 4736.

B. adenantha, sp. nov., resembles *B. asiatica*, Lour., in habit ; it is easily recognised by the glandular indumentum of the small greyish-purple corollas.

Buddleia agathosma, Diels. Sp. nov.

Frutex 1·2–2·2 m. altus. Caulis tomento detersili obtectus, ipse fulvus vel purpurascens. Folia in utraque facie, subtus densius, molliter tomentella tomento detersili, petiolus 1·5–3 cm. longus, superne alatus ; stipulae rotundae, integrae, 1·5–2 cm. diamet. ; lamina herbacea, mollis, supra rugosa, e basi

truncata ovata, crenato-dentata, dentibus conspicuis calloso-apiculatis, acuta, 9–14 cm. longa, 6–7 cm. lata, nervi supra immersi subtus prominuli. Inflorescentia demum paniculata, thyrsi bracteati, interrupti, e cymis subglobosis pedunculatis remotis compositi. Calyx tomentellus, 3·5 mm. longus, dentes breves lati. Corolla extus pubescens purpureo-coerulea vel violacea; tubus 6–7 mm. longus, 2·5 mm. latus; lobi 3·5 mm. longi, 3 mm. lati. Stamina supra medium affixa. Ovarium cum stylo pubescens.

"Shrub of 5–9 ft. On exposed cliffs to the west of Yunnanfu. Flowers purplish-lavender, very fragrant. Alt. 8000 ft. Yunnan. Flow. February 1905." G. Forrest. No. 593.

This new species is distinguished from the other Chinese forms by its large stipules, the truncate leaves which have a very soft tomentum and conspicuous regular toothing, and the head-like cymes forming a much interrupted thyrse. In affinity it seems to approach *B. officinalis*, Maxim.

Buddleia brachystachya, Diels. Sp. nov.

Frutex ramosissimus 30–50 cm. altus. Folia opposita petiolata crassiuscula mollia supra praeter costam glabrata subtus dense luteolo-tomentella, oblonga vel lanceolato-oblonga, integra vel varius obsolete dentata, 3–4 cm. longa, 1–1·2 cm. lata. Thyrsi breves nonnunquam fere capitati, 1·5–3 cm. longi. Calyx densissime tomentosus 2·5 mm. longus, lobi crassiusculi breviter triangulares obtusiusculi. Corolla lavandulaceo-coerulea fragrans 0·8–1 cm. longa extus stellato-pubescens, lobi intus glabri circ. 2 mm. longi. Stamina circ. in medio tubi inserta. Ovarium dense pilosum.

"Dwarf shrub of 12–18 inches. Flowers lavender colour and fragrant. In dry exposed situations amongst rocks, on the descent from the Lu-po pass to the Salwin, Mekong-Salwin divide. Lat. about 27° N. Alt. 7–8000 ft." G. Forrest. No. 1076.

B. brachystachya has the appearance of *B. alternifolia,* Max., but the leaves are opposite.

Buddleia Forrestii, Diels. Sp. nov.

Frutex 1·2–2·5 m. altus. Folia superiora in petiolum brevem angustata auriculato-stipulata, mollia, supra pilosula subtus tomento pallide cinnamomeo vestita, lanceolata vel oblanceolata, crenato-serrata, 10–20 cm. longa, 3–5 cm. lata. Inflorescentia thyrsoidea e cymis pedunculatis composita. Flores fragrantes, pedicellati, pedicelli 1·5–2 mm. longi parce pilosi. Calycis 4–5 mm. longi tubus parce stellato-pilosus, dentes sinu lato separati, breves, late triangulares, apice subrecurvi. Corolla castaneo-

fusca, 8–10 mm. longa ; tubus 3·5 mm. latus, extus parce pilosus, intus pubescens, lobi densius pilosi vel subtomentelli, 2·5–3 mm. longi. Stamina sub medio tubo vel paulo supra affixa. Ovarium glabrum.

"Shrub of 4–8 ft. Flowers grey and maroon, fragrant. Amongst scrub on the margins of pine forests on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 8–10,000 ft. July 1906." G. Forrest. No. 4666.

"Shrub of 10–15 ft. Flowers reddish-maroon, fragrant. On ledges of cliffs and very stony ground, western slopes of the Tsan Shan Range, near head of Yang-pi valley. Lat. 25° 40′ N. Alt. 9–10,000 ft. Flow. September 1903." G. Forrest. No. 979.

Allied to the beautiful *B. Colvillei*, Hook. f. of Sikkim, which has very similar leaves, but the flowers of the new species are smaller, the corollas more hairy, and the calyx of a different shape.

Buddleia myriantha, Diels. Sp. nov.

Frutex 1–2·5 m. altus. Folia superiora in petiolum brevem angustata, auriculata auriculis parvis, herbacea, supra sicca atro-viridia, pilosula, subtus dense tomentella cinereo- vel ochraceo-alba, lanceolata, acuta, minute duplicato-serrata, serraturis callosis, 10–13 cm. longa, 2·3–3 cm. lata, costa supra impressa. Inflorescentia paniculata ; thyrsi anguste cylindrici, 15–20 cm. longi, 2–2·5 cm. lati, e cymis pedunculatis compositi. Flores angusti, numerosissimi, cinereo-villosi. Calycis tubus 3 mm. longus, dentes lanceolato-lineares vel subulati, 1·5 m. longi, acuti. Corolla saturate vel luride purpurea 5–7 mm. longa. Stamina sub medio vel paulo supra affixa. Ovarium cum stylo clavato glabrum.

"Shrub of 6–10 ft. Flowers dull purple. Dry open situations on the borders of pine woods. Western slopes of the Tsan Shan Range. Yang-pi pass. Lat. 25° 40′ N. Alt. 7–9000 ft. September 1905." Forrest. No. 912.

"Shrub of 4–8 ft. Flowers deep purple, fragrant. Dry, stony situations on the margins of pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–9000 ft. June–August 1906." G. Forrest. No. 4760.

Allied to *B. variabilis*, Hemsl., but markedly different by the subulate teeth of the calyx and the villose corolla.

LORANTHACEAE.

Loranthus Balfourianus, Diels. Sp. nov.

Planta 0·3–1 m. longa. Rami crassiusculi laeves, cortice purpureo vel fusco, subnitido obtecti. Folia subsessilia, carnoso-coriacea glabra, oblonga, basin versus angustata, apice obtusa, praeter costam utrinque nervis 1–3 acutangulo-abeuntibus

(siccis) prominulis praedita, 4–6 cm. longa, 0·8–1·8 cm. lata. Flores extra-axillares pauci fasciculati, pedicelli 3–5 mm. longi. Bracteae obsoletae. Calyx bracteola triangulari adpressa suffultus, circ. 3 mm. longus, ore undulato paulum ampliatus, breviter ciliatus. Corolla glabra aurantiaco-kermesina, leviter curvata, cylindrica; tubus 15 mm. longus, superne circ. 2·5 mm. latus, basin versus ad 3 mm. dilatatus; limbi lobi 4 cochleariformes 4–5 mm. longi, 1·5 mm. lati. Stamina 4, filamenta purpurascentia circ. 2 mm. longa, antherae 2·5 cm. longae. Stylus 20–25 mm. longus. Fructus flavus ovoideus.

"Banks of Mekong between Bati and Tsekou. Alt. 6000 ft. Tibet. 1904." G. Forrest. No. 453.

"Plant of 1–3 ft. Flowers orange crimson, fruit yellow. Parasitical on many plants, but mostly those of the genera *Prunus* and *Salix*. On these in open situations amongst scrub on the eastern flank of the Lichiang Range. Lat. 27° 10′ N. Alt. 10,000 ft. May 1906." G. Forrest. No. 2215.

"This species is widely distributed in Yunnan. I have collected it in most valleys from Yunnanfu north to Tsekou 25°–28°. Most commonly parasitical on the Peach and a species of Salix. Alt. 4–10,500 ft. April–July."

A distinct species, as far as I can see, not closely allied to any of the species described from India.

Loranthus caloreas, Diels. Sp. nov.

Planta 0·6–1·2 m. diamet. Rami valde nodosi verrucoso-asperi, cinereo-corticati. Folia parva, ad ramulos abbreviatos nodiformes fasciculata, breviter petiolata vel subsessilia, coriacea, glabra, oblanceolata vel oblonga obtusa, (sicca) praeter costam enervia, 1·5–2 cm. longa, 2·5–5 mm. lata. Flores supra folia ad apices ramulorum pauci vel bini fasciculati, brevissime (1–2 mm.) pedicellati. Bracteae minutae late reniformes. Bracteola calyci appropinquata subovata, apice obtusa saepe ustulata, 1·6–2 mm. longa. Calyx ovoideo-cyathiformis, limbo in lobulos diruptus, 2–2·5 mm. longus. Corollae tubus curvatus et basi et apice attenuatus, intense scarlatinus, 2–2·5 cm. longus, limbi lobi 4 demum reflexi, saturate virides, circ. 0·5–0·6 cm. longi. Antherae erectae, edentatae, 3·5 mm. longae. Stigma capitatum parvum.

"Plant of 2–4 ft. Flowers bright scarlet, limb of perianth bright green. Parasitical, forming dense brilliantly coloured masses on conifers only, in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 9–11,000 ft. July 1906." G. Forrest. No. 2600.

Allied to *L. Balfourianus*, Diels, but the leaves are smaller, nearly veinless, the branches very rough and grey-barked, the corolla-tube more curved, the free segments green.

MALVACEAE.

Hibiscus Forrestii, Diels. Sp. nov.

Caulis 1·2–1·8 m. altus, praecipue superne hispidus. Foliorum petiolus hispido-pilosus, 6–10 cm. longus; lamina herbacea, in utraque facie hispida, 10–12 cm. longa, 12–15 cm. lata, 5–loba, lobis 2 inferis minoribus, omnibus ovatis acuminatis dentato-serratis. Bracteolae 5 lanceolatae, extus pilis luteolis dense hispidae, 2–2·5 cm. longae. Calyx spathaceus, 2·5 cm. longus, petala lutea basi purpureo–fusca, 5–6 cm. longa. Capsula densissime hispida.

" Plant of 4–6 ft. Flowers yellow, base of petals deep maroon. Dry, open hillsides around Teng-Yueh. Lat. 25° N. Alt. 6–7000 ft. October 1903." G. Forrest. No. 993.

Allied to *H. pungens*, Roxb., but much more hispid in all its parts, the leaves less deeply cut with more ovate segments, the flowers somewhat smaller.

MELASTOMATACEAE.

Oxyspora serrata, Diels. Sp. nov.

Frutex ramosus, 0·6–1·2 m. altus, rami cortice pallido brunneo costato praediti, novelli ad nodos strigulosi. Foliorum petiolus 1–2 cm. longus; lamina membranaceo-herbacea, supra in margine atque ad nervos exteriores faciei inferae parce hirto-setulosa, supra viridis subtus pallide violascens vel purpurascens, anguste ovata vel sublanceolata acuminata, serrata, 6–9 cm. longa, 1·6–3 cm. lata, nervi primarii 3 secundariis transversis conjuncti, secundarii marginales sursum arcuati conjuncti. Panicula terminalis, 5–20–flora. Pedunculi, pedicelli, receptaculum setuloso-glandulifera; pedicelli 3–6 mm. longi. Receptaculum campaniforme, 4–5 mm. longum, 2·5 mm. latum. Petala 8–10 mm. longa, late ovata, apice breviter acuminata, intense rosea. Staminum breviorum 7–8 mm. longorum connectivum basi dorsali calcare brevissimo plerumque reflexo praeditum.

" Branched shrub of 2–4 ft. Flowers bright rose-red. Moist, very shady situations on the Irrawadi-Ming-Kwang pass. Lat. 25° 50′ N. Alt. 8–9500 ft. Upper Burmah. October 1903." G. Forrest. No. 960.

Easily recognised by its serrate leaves with bristly hairs.

OLEACEAE.

Ligustrum ionandrum, Diels. Sp. nov.

Frutex dense ramosus 0·9–3 m. altus. Rami cortice pallide cinereo-fusco praediti, novelli dense pubescentes. Folia parva

breviter petiolata subrhombeo-elliptica vel subobovata apice obtusa vel acuta subcoriacea supra lucida in utraque facie glabra, nervi vix conspicui, 3 cm. longa, 1·5 cm. lata, ea ramulorum lateralium dimidio minora. Inflorescentiae ramulos breves terminantes pseudo-racemos circ. 2 cm. longos densifloros efficientes, earum rhachis subvelutina, flores glaberrimi fragrantes. Calyx 1·5 mm. longus, apice subtruncatus obsoletissime 4–dentatus. Corollae albae tubus 4 mm. longus sub limbo infundibuliformi-ampliatus, lobi reflexi 1·5–2 mm. longi. Antherae oblongae violaceae e fauce exsertae. Stylus 2–2·5 mm. longus, stigma apice bilobum.

"Compact shrub of 3–9 ft. Flowers white, anthers violet, fragrant. Dry, open situations amongst scrub in side valleys on the eastern flank of the Lichiang Range. Lat. 27° 10′ N. Alt. 9–10,000 ft. Flow. May 1906." G. Forrest. No. 2196.

This species is allied to *L. Henryi*, Hemsl., but it has a more compact habit and narrower leaves.

Jasminum Beesianum, G. Forrest et Diels. Sp. nov.

Frutex 0·3–0·9 cm. altus. Rami novelli pilosi demum glabrati, angulati, ramulosi. Folia opposita, simplicia, parva, brevissime petiolata, ovata vel lanceolata, supra praeter costam glabra subtus pubescentia pallida, 1·2–2·5 cm. longa, 0·5–0·8 cm. lata. Flores ad apicem ramulorum singuli vel saepius terni, clavato-pedicellati. Calycis lobi lineares, 2·5–5 mm. longi, quam tubus fere duplo longiores. Corolla rosea vel purpurascens fragrantissima, tubus circ. 1 cm. longus antrorsum sensim ampliatus, lobi erecti vel demum patuli, late elliptici vel suborbiculares, 4–5 mm. longi, 3–4 mm. lati.

"Shrub of 1–3 ft. Flowers pink or deep rose, strongly fragrant. Amongst rocks and stones on dry, barren, open ground at the south end of the Sung-kwei valley. Lat. 26° 20′ N. Alt. 8–9000 ft. Flow. April 1906." G. Forrest. No. 2021.

A beautiful shrub, of the section *Unifoliolata*, DC. It is nearly related to a specimen in the Paris Herbarium named *Jasminum Delavayi* by Franchet (but never published), collected by Bonvalot and the Prince of Orleans, between Batang and Litang in a humid valley, on June 19th. This has the corolla lobes somewhat mucronulate, and the foliage more glabrous, but I think it belongs to the same species. Why Franchet named it "J. Delavayi" in manuscript I do not know. I have not seen any specimens of it collected by Delavay in the Paris Herbarium. Therefore I prefer not to use the name suggested by Franchet.

ONAGRACEAE.

Epilobium Forrestii, Diels. Sp. nov.

Caulis strictus, simplex vel basi pauci-ramosus ramis virgatis. Folia basalia petiolata, lamina elliptica subtus purpurea glabra ; caulina sessilia, glabra, erecta, oblonga, obsolete paucidentata, 1·5–2·5 cm. longa, 0·3–0·6 cm. lata. Flores racemosi, longiuscule pedunculati, pedunculi 2–2·5 cm. longi. Calycis purpurei lobi lineari-lanceolati 6–7 mm. longi, 2 mm. lati. Petala intense roseo-purpurea, 12 mm. longa, 10 mm. lata, apice alte incisa, lobis subtruncatis nonnunquam obsolete angulato-dentatis. Ovarium cinereo-pubescens, mox leviter curvatum, 1·5–2·5 cm. longum. Stylus 10–12 mm. longus, stigmata 3 patentia.

" Plant of 10–16 inches. Flowers deep rose-purple. Stony, boggy situations in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. July–August 1906." G. Forrest. No. 4460.

PAPAVERACEAE.

Corydalis homopetala, Diels. Sp. nov.

Planta 15–30 cm. alta. (Folia basalia non visa). Folia membranaceo-herbacea, caulina inferiora petiolo 2–4 cm. longo praedita, ternato-composita, pinnae primi ordinis cum petiolulo 3–4 cm. longo bicompositae, segmenta ultima subovata vel oblanceolata, apiculata, 0·5–1 cm. longa. Racemus haud multiflorus. Bracteae inciso-dentatae, superiores integrae ; pedicelli 3–12 mm. longi, demum decurvato-patuli. Flores flavi, colore obscuriore suffusi, fragrantes. Petali exterioris postici lamina vix cristata alata-ve 5 mm. longa ; calcar 10 mm. longum subrectum vel levissime decurvatum ; petalum exterius anticum (calcare neglecto) postico simillimum, lamina 4 mm. longa, clavis 4 mm. longa. Petala interiora apice cohaerentia, 9–10 mm. longa. Capsula (immatura) obovoidea.

" Plant of 6–12 inches. Flowers yellow with darker markings, fragrant. Open grassy situations on the margins of cane brakes on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. Flow. July 1906." G. Forrest. No. 4379.

Not far from *C. petrophila*, Franch., but the foliage is less cut, the flowers yellow, the blade of the outer petal hardy crested.

Corydalis Balfouriana, Diels. Sp. nov.

Radices napiformi-incrassati. Caules complures, simplices, 20–30 cm. alti. Folia basalia pauca, 1–2, petiolo adscendente

4–7 cm. longo praedita, trifoliata, foliola latissime obovata vel obtriangularia, apice vel fere ad medium dentato-incisa, 1–2·3 cm. longa, 1·5–2 cm. lata. Folia caulina 1–2, raro petiolata, plerumque sessilia, ad basin tripartita segmentis integris semiovatis vel lanceolatis vel iterum 2–3-partitis. Bracteae integrae, ovatae, sursum decrescentes. Florum inferiorum pedicelli graciles, 8–15 mm. longi. Petalum exterius posticum vix alatum, apice subacutum, 4–5 mm. longum, calcare 6–8 mm. longo obtuso lato instructum, anticum concavum, anguste alatum, interiora basi bidentata apice cohaerentia atque exterius posticum 10 mm. longum paulo superans.

"Shady places round city wall, Talifu. Alt. 6500 ft." G. Forrest. No. 67.

"Mekong Valley round Hsia Wei Hsi, mountain pastureland, open places in pine woods. Alt. 7–9000 ft." G. Forrest. No. 68.

It is related to *C. pachycentron*, Franch., and *C. trifoliolata*, Franch., but from these and all the allied species easily recognised by its broad shallowly cut basal leaves. I am doubtful whether the locality for No. 67 is right. The specimen is quite identical with No. 68; it may be a mistake with the label.

Corydalis yunnanensis, Franch. var. **megalantha,** Diels.

Flores cum calcare 2–2·7 cm. longi.

"Shady situations in mixed forests on the Mekong-Salwin divide. Lat. 28° 12′. Alt. 10,000 ft. Flow. September 1904." G. Forrest. No. 223.

"Shady situations in the Mekong Valley near Bati. Lat. 27° 40′. Alt. 6–9000 ft. Flow. October 1904." G. Forrest. No. 292.

Corydalis heterocentra, Diels. Sp. nov.

Caules complures, adscendentes, 25–40 cm. alti. Folia membranaceo-herbacea, basalia 10–20 cm. longe petiolata, ternato-composita, pinnae primi ordinis circ. 2·5 cm. longe petiolulatae, ipsae 2–2·5 cm. longae et latae, pinnae secundi et tertii ordinis iterum iterumque fere ad basin tripartitae, segmenta ultima anguste cuneato-linearia, obtusa vel obsolete ustulato-apiculata. Folia caulina pauca, basalibus similia, decrescentia. Bracteae inferiores partitae, superiores oblongae integrae. Pedicelli 1–2·5 cm. longi bracteam superantes. Flores purpurascenti-rosei; petala interiora basin versus albida. Sepala oblonga vel lanceolata paucidentata. Petali exterioris postici lamina ala angusta dentata utrinque praedita, vix cristata, acuta, 8–10 mm. longa, calcar rectum vel paulum decurvum, 12–14 mm. longum. Petali exterioris antici lamina 7–10 mm. longa, utrinque

ala 4–5 mm. lata dentata ornata, clavis 6–7 mm. longa basi conspicue saccata vel breviter calcarata. Petala interiora apice cohaerentia, bidentata, circ. 10 mm. longa.

" Plant of 10–16 inches. Flowers purplish-rose with white markings. Dry, stony situations at the base of cliffs on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–11,000 ft. Flow. August 1906." G. Forrest. No. 4382.

The leaves of this nice plant remind to those of our *C. cava*. The structure of the anticous petals is remarkable by the broad wings of the lamina and the short basal spur. The shape of the flowers is not unlike that of *C. mucronata*, Franch., of Mupin, which is easily distinguished by its fimbriate sepals.

Corydalis Bulleyana, Diels. Sp. nov.

Rhizoma subrepens. Caules plures, 15–60 cm. alti. Folia radicalia numerosa, glauca, longissime (3–15 cm.) petiolata, lamina ambitu late triangularis, pinnae primi ordinis inferiores petiolulatae, secundi ordinis subsessiles iterum alte fissae, segmenta ultima late cuneata vel demum sublinearia, obtusiuscula vel apiculata, purpureo-marginata. Folia caulina nonnulla basalibus similia decrescentia. Bracteae oblongae vel obovatae pleraeque integrae. Flores 5 mm. vel brevius pedicellati " roseo-lavandulacei " vel saturate rosei, fragrantes. Petali exterioris postici lamina 8–10 mm. longa ala (vel "crista") dentata conspicua ornata, calcar leviter decurvum obtusiusculum 11–14 mm. longum; petalum exterius anticum 10–14 mm. longum, antrorsum crista dentata ornatum, basi minute saccatum. Petala interiora bidentata circ. 6–10 mm. longa. Capsula cylindrica stylo incurvo ornata.

" Plant of 6–10 inches. Flowers deep rich rose, fragrant; margins of leaves crimson. Moist situations on limestone drift at base of limestone cliffs on eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 10–11,000 ft. June 1906." G. Forrest. No. 2249.

" Au dessus du village de San tchang Kien (Ho Kin), 8 juillet 1889." Delavay. No. 3757 in Herb. Paris.

The species is allied to *C. taliensis*, Franch.

POLYGONACEAE.

Polygonum Emodi, Maxim., var. **dependens,** Diels. Var. nov.

Planta quam typica major et robustior. Rami floriferi ad 20 cm. longi. Folia ad 12 cm. longa, 1·6 cm. lata. Racemi 3–5 cm. longi. Cetera typica.

"Plant of 1–2 ft. Flowers deep crimson. Pendulous on cliffs and boulders, forming clumps, on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10–11,000 ft. August 1906." G. Forrest. No. 2761.

I have never seen any Himalayan specimen of *P. Emodi*, Meissn., as large as this variety. Apart from the extraordinary development of all parts, our plant agrees with the type in every respect.

Polygonum jucundum, Diels. Sp. nov.

Caulis (vix radicans ?) 0·3–0·6 m. altus, purpurascens, superne parce strigillosus. Ochreae scariosae, fuscae, petiolo multo longiores pilis brevibus recurvis purpurascentibus subhispida. Folia ad basin petioli circ. 0·5 cm. longi auriculo parvo praedita, herbacea subtus pallidiora saepe margine purpurascentia, parce hispida, lanceolata vel lanceolato-oblonga, apice acuminata, 5–8 cm. longa, 2·2–2·6 cm. lata. Capitula plerumque geminata, pedunculata pedunculo minute scaberulo, 5–8 mm. diamet. Bracteae glabrae, late ovatae, valde concavae, in mediana virides ceterum scarioso-hyalinae, circ. 3–3·5 mm. longae, 2·5 mm. latae. Perianthium basi conspicue attenuata ovarium amplectens, pallide purpureo-roseum ; segmenta anguste obovata 4·5–5 mm. longa. Stamina 8, circ. 3 mm. longa, perianthii segmenta aequantia. Ovarium 0·6–0·7 mm. longum, styli ultra medium connati circ. 1·3 mm. longi.

" Plant of 1–2 ft. Flowers pale purplish-pink. Open situations, amongst grass, along the base of the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 6700–8000 ft. June–July 1906." G. Forrest. No. 4576.

Sect. *Cephalophilon*. Allied to *P. sphaerocephalum*, Wall., *P. microcephalum*, Don, and *P. capitatum*, Ham. I have not seen the ripe fruit.

Polygonum cyanandrum, Diels. Sp. nov.

Caules basi nonnunquam radicantes, parce ramosi, 5–30 cm. longi. Folia inferiora quam superiora minora. Ochreae scariosae fuscae pilis retrorsis albidis quasi barbatae, petiolo breviores. Petiolus 2–10 mm. longus. Lamina membranacea, subtus pallidior, parce ciliata vel tota glabra, e basi saepe subtruncata ovata vel oblongo-ovata, 0·3–2 cm. longa, 0·25–1·5 cm. lata. Capitula parva pauciflora inter folia summa fere occulta. Flores breviter pedicellati. Perianthii albidi segmenta subobovata vel oblongo-elliptica, 1·3–1·5 mm. longa, 0·8–1 mm. lata. Stamina 8 fertilia, antherae cyaneae. Nectaria interstaminalia conspicua. Styli 3, stigmata capitata.

" Procumbent plant of 6–12 inches. Flowers greenish-white,

tipped pink. Moist, grassy situations on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10–11,000 ft August 1906." G. Forrest. No. 2670 pt. (Mixed with *P. radicans*, Hemsl.)

" Plant of 2–4 inches. Flowers white. Moist, open situations on mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10–11,000 ft. September 1906." G. Forrest. No. 2923. Much smaller specimens.

Nearly allied to the Himalayan *P. filicaule*, Wall., but more branched; leaves larger, subtruncate at the base, more glabrous; stamens all fertile. In habit, it resembles *Koenigia pilosa*, Maxim. The two specimens are very different in size.

Polygonum radicans, Hemsl. in Journ. Linn. Soc. xxvi, 347.

Perianthii segmenta glandulosa. Stamina fertilia 3, staminodia 5, omnia caerulescentia.

" Plant of 2–5 inches. Flowers pale rose. On moist, moss-covered ledges of cliffs and boulders in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. August 1906." G. Forrest. No. 4569.

The type is from summit of Mount Omi, Szechuan.

This is very near to *P. cyanandrum*, Diels, and *P. filicaule*, Wall., also to *Koenigia fertilis*, Maxim., but differs by the strigillose leaves, the number of stamens and staminodes.

Polygonum delicatulum, Meissn. in DC. Prodr. xiv (1857), 127.

Specimina nostra androecio trimero atque fructibus perianthio vix longioribus praedita.

" Plant of 3–6 inches. Flowers pale pink. Moist, rocky, or shady situations. Western slopes of the Tsan Shan Range. Lat. 28° 40′ N. Alt. 9–11,000 ft. September 1905." G. Forrest. No. 900.

" Plant of 1–4 inches. Flowers pinkish-white. Stony pasture on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. July–August 1906." G. Forrest. No. 4568.

Polygonum Forrestii, Diels. Sp. nov.

Rhizoma sympodiale, longe reptans, hypophyllis amplis scariosis purpureo-fuscis dense obtectum, apice folia sparsa longius petiolata atque caulem floriferum emittens. Caulis parce foliatus plerumque ramo 1–2 emisso recto quasi bifurcatus, 5–25 cm. longus, plus minusve villosus. Folia basalia petiolo 3–5 cm. longo praedita, suborbicularia vel elliptico-reniformia, obtusa, hinc inde pilosa, margine nonnunquam undulato densius ciliato, subtus saepe purpurascentia, 1–3 cm. longa, 1·2–3·5 cm. lata,

nervi patentes. Folia caulina similia, brevius petiolata ; ochreae petiolo conspicue breviores. Inflorescentia corymboso-paniculata dense conferta, hinc inde foliata. Bracteae tenuiter scariosae fuscae, pedicellis longioribus ; pedicelli dense pilosi, 2–4 mm. longi. Tepala 4–5, inaequalia, nonnunquam partim connata, marginibus saepe sese tegentia, obovata vel late obovata, plurinervia, basi subsaccato-producta, ochroleuco-alba, intus ima basi nectariis transversis atropurpureis praedita, 2·5–3·5 mm. longa et lata. Stamina 6–8, circ. 1·5 mm. longa, antherae atropurpureae vel fuscae. Gynaeceum 0·7–0·8 mm. longum, styli 3 liberi, stigmata capitata.

" Marshy ground on hillsides. Descent of Kari Pass, Yangtse-Mekong divide. Alt. 10,000 ft. Tibet, 1904." G. Forrest. No. 38.

" Plant of 2–4 inches. Flowers white. Crevices of limestone cliffs on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 2911.—Smaller than the other specimens. Stems often not much longer than the basal leaves.

" Plant of 4–8 inches. Flowers creamy white. Moist ledges and in crevices of cliffs in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–11,000 ft. June–September 1906." G. Forrest. No. 4590.

Also Tali region, Delavay, No. 261, No. 4043 in Herb. Paris and Tsekou, Monbeig in Herb. Kew.

This remarkable *Polygonum* is similar in habit to *Oxyria*. Its affinity is with *P. nummularifolium*, Meissn., of the Alpine Himalaya, but it differs by the number of stamens and styles, and generally much larger size. It shows evidently that Hooker (Fl. Brit. Ind. v, 49) was right in placing *P. nummularifolium* into *Aconogon* ; Meissner thought it belonged to *Cephalophilon* (DC. Prodr. xiv, 127).

Polygonum suffultum, Maxim. in Bull. Acad. Sc. St. Pétersbourg, xxii (1877), 233. (Mél. biolog. ix, p. 616). I.F.S. ii, 350 (Journ. Linn. Soc. xxvi, 350).

" Plant of 6–12 inches. Flowers pink. Moist, grassy, shady situations in mixed and pine forests on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 9–10,000 ft. May 1906." G. Forrest. No. 2186.

" Plant of 9–12 inches. Flowers white. Mossy, shady situations in mixed forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. June–August 1906." G. Forrest. No. 4571.

" Plant of 3–6 inches. Flowers pinkish white. Shady, grassy situations on the margins of pine forests on the eastern flank of

the Tali Range. Lat. 25° 40′ N. Alt. 9–11,000 ft. May–June 1906." G. Forrest. No. 4585.

Rhizoma in speciminibus nostris haud rectum, sed horizontale, caules saepe solitarii ; folia supra et margine puberula, ceterum plantae japonicae similis videtur. Planta simillima est *Polygonum constans*, Cummins, from Yatung (Chumbi) and Sikkim.

Polygonum leptopodum, Diels. Sp. nov.

Caulis subsimplex vel basi valde ramosus, rami adscendentes, non nisi parte infera foliati, deinde longe nudi, subglabri, 5–30 cm. longi. Stipulae breves pallidae ; petiolus foliorum inferiorum 1–1·5 cm. longus, superiorum brevior ; lamina firme herbacea, praecipue supra scaberula, e basi sagittata vel truncata triangularis, 1·5–2 cm. longa et (basi) lata, vel minor. Panicula e racemis remotis longe pedunculatis filiformibus composita. Racemi nonnunquam interrupti 0·6–1·5 cm. longi, graciles. Bracteae stipulis similes quasi semicymbiformes circ. 1·5 mm. longae, saepe purpurascenti-suffusae ; pedicelli ad 3 mm. longae. Petala subelliptica 1·5–2 mm. longa, alba vel rosea. Antherae albae vel roseae. Ovarium 0·8 mm. longum, styli 3 liberi filiformes 1 mm. longi.

" South end of Lang Kung valley. Dry, stony hillsides. Alt. 9000 ft. 1904." G. Forrest. No. 202.

" Plant of 2–6 inches. Flowers white. Dry, stony ground at the northern end of the Lichiang Plain. Lat. 27° 10′ N. Alt. 8500–9000 ft. July 1906."

" Plant of 6–12 inches. Flowers white. Open, stony pasture-land on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–8000 ft. May 1906." G. Forrest. No. 4570.

Sect. *Fagopyrum.* The only allied species is *Polygonum gracilipes,* Hemsl., of Szechuan and Hupeh ; but this has taller, more leafy stems, axillary inflorescences, and fewer more distant flowers in a very narrow spike.

Polygonum oliganthum, Diels. Sp. nov.

Caules numerosi, graciles, basi radicantes, 0·4–0·6 m. longi, minutissime aculeolati, ad nodos aculeolis recurvis magis conspicuis praediti, internodia superiora longa. Stipulae longe tubulosae puberulae, apice truncatae longeque ciliatae, 0·8–1 cm. longae ; petiolus purpurascens, scaber, 0·6–0·8 cm. longus ; lamina herbacea, e basi truncata ovata, apice acuminata, 2·5–3 cm. longa, 1–1·3 cm. lata, nervi primarii 12–15 utrinque patentes. Inflorescentia pauciramosa glanduloso-pubescens, saepe purpureo-suffusa, flores pauci, inferi remoti ; bracteae latissime ovatae, margine lacerae, 3 mm. longae, plerumque biflorae ;

pedicelli 1·5 mm. longi. Petala rosea 3 mm. longa. Ovarium 0·8 mm. longum, styli 3 longe connati, apice liberi, stigmata capitata. Nux perianthio inclusa, perianthium subaequans, trigona brunnea nitida.

"Slender plant of 1–1½ ft. Flowers pale rose. Amongst long grass on mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 10–11,000 ft. September 1906." G. Forrest. No. 2985.

Sect. *Echinocaulon.* Allied to the polymorphous *P. pedunculare*, Wall., from which it differs by the shape of the leaves, the bracts, and the trigonous nut.

Polygonum calostachyum, Diels. Sp. nov.

Caudex percrassus, stipulis fuscis dense obtectus. Caulis 0·3–0·6 m. altus, glaber, foliatus. Foliorum basalium petiolus 5–7 cm. longus, latus; lamina subchartacea, supra lucida subtus parce puberula, ceterum glabra, elliptica, basi rotundata vel inaequilateraliter in petiolum decurrens, apice breviter acuminata, 10–15 cm. longa, 3·8–4·6 cm. lata. Folia caulina petiolo stipulis breviore suffulti, lamina basi subcordata nonnunquam subamplectens. Racemi 4–5 cm. longi, fere 2 cm. lati; bracteae imbricatae late tubulosae, limbi lobi apice breviter acuminati, pedicelli graciles 5–7 mm. longi. Flores (an semper?) suberecti vel patuli. Corolla "intense kermesina," sicca atropurpurea, petala ovato-elliptica 5–6 mm. longa, 3–4 mm. lata. Stamina 8. Ovarium elongatum, styli liberi 4 mm. longi.

"Plant of 1–2 ft. Flowers deep crimson. Moist mountain meadows on the eastern flank of the Mekong-Salwin divide. Lat. 28° N. Alt. 9–11,000 ft. September 1904. S.-E. Tibet." G. Forrest. No. 241.

Also Tsekou (Monbeig in Herb. Kew!).

Sect. *Bistorta.* An allied plant to this was collected in a very incomplete state by Griffith, in Bhotan, on rocks above Sanah vix infra 9500 ad 10,000 ft. (Griff. Itin. Notes, p. 410, n. 637.) (*P. Griffithii*, Hook. f. cf. Hook. Fl. Brit. Ind. v, 54.) It may prove identical with our new species.

Polygonum subscaposum, Diels. Sp. nov.

Caudex crassus, apice stipulis amplis fuscis foliorum basalium coronatus. Caules complures non nisi basi foliati, superne squamis fuscis (ochreis elaminatis) tecti, 15–25 cm. longi, glabri. Foliorum basalium petiolus 2·5–4 cm. longus, latus, glaber; lamina subherbacea, supra scabra subtus tomento pannoso pallide cinnamomeo vel albido dense vestita, ± elliptica vel elliptico-ovata, ad 12 cm. longa 6 cm. lata, sed dimensionibus varia, nervi numerosi

tenues, reticulati, marginem revolutum versus incrassati ibique colore pallidiore conspicui. Racemi densiflori, ca. 3 cm. longi, 1·2–1·5 cm. lati; flores intense rosei patuli vel subdecurvi; bracteae scariosae fuscae acuminatae.

"Plant of 6–9 inches. Flowers bright pink. Moist, rocky mountain meadows on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 12–13,000 ft. August 1906." G. Forrest. No. 4559.

Sect. *Bistorta*. Allied to *P. affine*, Don, of the Western Himalaya; recognised by the large broad leaves with buff tomentum beneath, the short, nearly leafless, scapes with brown scales.

Rheum Forrestii, Diels. Sp. nov.

Rhizoma robustissimum. Acaulis? Folia (non nisi manca visa) basalia? coriacea, e basi subcordata suborbicularia breviter acuminata. Panicula scapum 0·6–0·8 cm. longum striatum basi glabrum supra papillosum terminans, rami inferiores 5–6 cm. longi iterum ramosi, superiores abbreviati, demum erecti. Pedicelli graciles filiformes. Perianthii segmenta alba, viridi-uninervia, longiora circ. 2 mm. longa, 1·2–1·4 mm. lata. Stamina 9–10, crassa, subconica, brevia, 0·6 mm. longa. Ovarium obovoideum, styli 3 decurvi subclavati. Perianthium fructiferum vix ampliatum. Fructus ambitu subellipticus trialatus, basi alte cordatus, apice subretusus, corpus circ. 7–8 mm. longum, 5–6 mm. latum, granulatum; alae fuscae, 1–1·5 mm. latae.

"Plant of 2–2½ ft. Flowers white. Clefts and ledges of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 9500–11,000 ft. July 1906." G. Forrest. No. 2463.

The material of this interesting addition to the genus is very incomplete. It seems to be related to *R. tibeticum*, Maxim., but further material is wanted for a better understanding of the species.

RANUNCULACEAE.

Clematis Delavayi, Franch., in Bull. Soc. Bot. Fr. xxxii (1885), 360. var. **spinescens**, Balf. f. ms.

Frutex 0·6–1 m. altus, divaricati-ramosus, rigidus, rami demum subspinescentes. Foliorum minutorum petioli et rhachides saepe persistentes. Folia 1–2 cm. longa, 2–4-juga, foliola integra, 3–4 mm. longa, 1–2 mm. lata. Flores terminales plerumque solitarii, raro ternati; sepala 0·6–1·2 cm. longa, viridescenti-albida. Cetera typi.

"Extremely arid situation on limestone formation in the valley

of the Yangtse below Pung-tzu-la. Lat. 28° 18′ N. Alt. 9–10,000 ft. September 1904." G. Forrest. No. 92.

This is an extremely xerophytic form of *C. Delavayi*, in aspect very unlike the southern type. Still it is easily recognised by the pinnate leaves being silky beneath.

Thalictrum tofieldioides, Diels. Sp. nov.

Rhizoma apice petiolorum pristinorum vestigiis fibrosis vestitum. Folia omnia basalia,petiolo violascente 5–10 cm. longo praedita ; lamina estipellata, papyracea, supra lucida, nervis (siccis) prominulis notata, subtus pallide glaucescens, ternata, rami inferiores iterum ternati, segmenta fere sessilia, reniformi-rotundata crenata vel subdentata, foliola 0·7–1 cm. longa. Scapi 1–3, rigescentes, 20–40 cm. alti, sicci sulcati glabri, apice simplices vel ramis suberectis 1–3 aucti, rami basi nudi antrorsum racemum angustum fere subspicatum (floribus initio fere sessilibus demum breviter pedunculatis) gignentes. Perianthium luteum. Sepala staminibus breviora 3–3·5 mm. longa. Stamina 5 mm. longa, filamentum apice haud dilatatum antheram aequans vel sublongius, antherae oblongae minute mucronulatae. Carpella circ. 3–5 quam stamina breviora, ovarium papillosum quam stigma sessile subsagittatum elongatum ampluni fere duplo brevius.

" Plant of 9–15 inches. Flowers yellow. Dry, shady situations amongst scrub on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 9–10,000 ft. May 1906." G. Forrest. No. 2149.

Yunnanfu, Tchong-chan, 25th June 1905. (Ducloux, No. 3578.)

The plant is allied to T. *alpinum*, Linn., and *T. leuconotum*, Franch. From the former it is distinguished by the more rounded leaflets, the taller scapes, the nearly sessile flowers, the yellow perianth, the less mucronate anthers ; from *T. leuconotum* it is separated by the exstipellate leaves, the leafless scapes, the greater number of carpels, and the much shorter carpel.

Anemone trullifolia, Hook. f. et Thoms. Fl. Ind. p. 22. Flor. Brit. Ind. i. (1872), p. 9.

var. **holophylla,** Diels.

Folia basalia vix petiolata vel lamina in petiolum sensissime transeunte praedita, tenuiter herbacea, longe pilosa, cuneata, basin versus integra, apice crenato-serrata, 4–8 cm. longa, 1·5–2·3 cm. lata. Scapus 12–18 cm. longus. Folium involucrale tripartitum, segmentis anguste ovatis integerrimis. Perianthium extus coeruleum intus album.

"Plant of 2–5 inches. Perianth white, exterior bluish. Forming large patches on open, grassy, rocky slopes, eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10–11,000 ft. May 1906. Yunnan, W. China." G. Forrest. No. 2166.

"Plant of 6–10 inches. Interior of perianth white, exterior blue. Open situations in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10,500–11,000 ft. June 1906." G. Forrest. No. 2226.

This variety is very much like the var. *Souliei*, Fin. et Gagnep., but has white (exterior blue) flowers, not yellow ones.

Anemone obtusiloba, Don, var. **coerulea,** Ulbrich in Engler's Bot. Jahrb. xxxvii, p. 242.

Folia basalia conspicue petiolata; lamina herbacea, subtus dense et longe pilosa, alte trilobata, segmentis latis obovatis crenatis, 1·5–2·5 cm. longa et lata. Scapus 4–10 cm. longus. Folium involucrale tripartitum, segmentis late ovatis inciso-lobatis et crenato-serratis. Perianthium extus coeruleum intus album.

"Plant of 2–6 inches. Flower white, exterior of perianth blue. Crevices of rocks, eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10–11,000 ft. May 1906. Yunnan, W. China." G. Forrest. No. 2152.

"Plant of 2–4 inches. Exterior of perianth blue, interior white. Arid, stony plain at the north end of the Lichiang valley. Lat. 27° 12′ N. Alt. 8500 ft. June 1906." G. Forrest. No. 2232.

A reduced form, only 2·5–5 cm. high, with flowers white striped bright green seems to belong to the same variety.

"Stony pastureland at base of the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 9–10,000 ft. July 1906." G. Forrest. No. 2634.

This is hardly different from certain forms of *A. trullifolia*, Hook. f. et Thoms.

Caltha palustris, L. var. **umbrosa,** Diels. Var. nov.

Planta gracilis, 15–30 cm. alta. Foliorum basalium petiolus 10–12 cm. longus, lamina membranaceo-herbacea alte cordata 2–3·5 cm. longa et lata argute dentata. Folia caulina reducta alte partito-incisa segmentis argute serratis vel dentatis. Flores aurantiaco-flavi pro genere parvi. Sepala anguste obovata 0·7–1 cm. longa, 0·5–0·7 cm. lata. Carpella 4–6.

"Plant of 6–9 inches. Flowers orange-yellow. Moist situations in shady pine forests along the base of the eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 11,000 ft. June 1906." G. Forrest. No. 2479.

This variety is easily recognised by the slenderness of all its parts, the small flowers, the limited number of carpels.

Delphinium Forrestii, Diels. Sp. nov.

Caulis crassus, 22–32 cm. altus, dense hispidus. Folia pleraque basalia longe petiolata petiolo 10–12 cm. longo, hispidula, ambitu orbicularia alte 5–fida, segmentis iterum fissis alte crenato-serratis, 5–6 cm. longa, 7–8 cm. lata ; folia caulina pauca, brevius et latius petiolata, sensim in bracteas trifidas vel supremas integras transeuntia. Racemus multiflorus, densus, 12 cm. longus, 5 cm. latus ; pedunculi floresque axi contigui, bracteolae binae anguste oblongae flori approximatae, hirsutae. Perianthium ex collectore "pellucidum pallide et dilute lilacinum venis saturatius violaceis pictum," extus pilis longis hispidum et glandulis elongatis (siccis) flavis obsitum. Sepalum posticum calcare quam lamina paulo breviore 2 cm. longo praeditum, lamina circ. 3 cm. longa ; lateralia latissime ovata 1·6–1·8 cm. longa. Petala (sicca) atrofusca, omnia glabra, superiora cum calcare quam calcar sepalinum aliquantum breviore circ. 3 cm. longa, inferiora ad basin unguis subcallosa lamina alte bifida praedita, circ. 1·3 cm. longa. Carpella 3, ovarium hirsutum.

"Plant of 9–12 inches. Perianth semi-transparent, of a pale, watery, violet-purple colour, veined a darker shade. Open mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 12–13,000 ft. September 1906." G. Forrest. No. 3030.

This is the first species of the remarkable tribe "*Brevicalcarata*," Huth (in Engler's Bot. Jahrb. xx (1895), 392), discovered in South-western China ; it is distinguished from the allied forms by the totally glabrous petals.

Delphinium Bulleyanum, G. Forrest, msc. Sp. nov.

Caulis 0·6–1·4 m. altus, praeter inflorescentiam pubescentem laevis, subglaucescens vel violascens, glaber. Folia et basalia et caulina longe petiolata, petiolo 5–8 cm. longo ; lamina utrinque striguloso-pilosula, subtus pallida, 5–6 cm. longa, 9–10 cm. lata, alte palmatifida, segmenta subcuneata, inciso-serrata. Inflorescentia foliis jam mediis ramos fertiles gignentibus ampla paniculata ; pedunculi pubescentes stricti, subcurvati, bracteolis 2 oppositis, minutis, subulato-linearibus praediti, 2–2·5 cm. longi. Flores intense et saturate coerulei ; perianthium extus puberulum. Sepala ovato-elliptica, apice obtuso-acuminata, 1–1·3 cm. longa, 0·5–1·6 cm. lata, calcar valde hamatum fere hippocrepiforme, ad insertionem floris apice reversum ; petala superiora apice emarginata, inferiora alte bifida ciliata atque barbata. Carpella 3, ovarium parce pilosulum.

"Plant of $2\frac{1}{2}$–$4\frac{1}{2}$ ft. Flowers deep rich blue. Moist, rocky situations amongst scrub on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. August 1906." G. Forrest. No. 2694.

This *Delphinium* is easily recognised by the curious shape of the spur of the perianth. It resembles therein *D. Bonvaloti*, Franch., of the Tatsienlou region, but is distinguished from that by its pubescent leaves, the colour of the perianth, and the nearly glabrous carpels. Soulié, No. 1097 was placed with *Delphinium Delavayi*, Franch., var. *acuminatum*, Franch., by Finet et Gagnepain, but is different from it; it has a similar spur to that of *D. Bulleyanum*, but longer and more hairy flowers.

Aconitum jucundum, Diels. Sp. nov.

Caulis 0·6–0·9 m. altus, praeter inflorescentiae axem pubescentem glaber. Folia fere omnia basalia, petiolo ad 45 cm. longo praedita; lamina tenuiter herbacea, supra glabra subtus ad nervos prominentes parce pilosa, ambitu pentagona, 13–14 cm. longa, 15–16 cm. lata, alte 5–fida, segmentis cuneato-obovatis, antrorsum argute crenato-serratis serraturis nonnullis acuminato-protractis. Racemus simplex vel basi subramosus gracilis; bracteae basales inferiores longe vaginantes, apice breviter 5– vel trifida foliaceae, superiores ovatae vel oblongae, integrae coloratae; pedunculi graciles, inferiores 2·5 cm. longi, superiores breviores luteo-hirsuti. Flores "roseo-purpurascentes" parce pilosi. Cassis gracilis 1·6–1·8 cm. alta, basi 1–1·2 cm. lata in rostrum subrecurvum elongata. Sepala lateralia 1 cm. longa, 0·9 cm. lata, intus barbata, inferiora anguste ovata vel lanceolata 0·7 cm. longa. Petala calcare involuto et lamina illud vix superante appendiculo barbulato ornata praedita 1·5 cm. longa. Carpella 3, ovarium dense pilosum.

"Plant of 2–3 ft. Flowers rose-purple. Open mountain meadows on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–11,000 ft. August 1906." G. Forrest. No. 4369.

This is a species of the *Lycoctonum* section, but completely different from *A. brevicalcaratum* (Fin. et Gagnep.), Diels. The stem and leaves are nearly glabrous, the flowers pedunculate, the perianth pale coloured, the hood less beaked, the petals totally different, and the carpels more hairy, although all other parts of the plant are much more glabrous.

It resembles *A. scaposum*, Franch., of Central China, but the bracts are all entire, the hood shorter, the leaves more deeply cut and more glabrous.

Aconitum brevicalcaratum (Fin. et Gagnep. s. tit. var.) Diels.

A. Lycoctonum, Linn., var. *brevicalcaratum*, Fin. et Gagnep., f. *bracteatum*, Fin. et Gagnep. in Bull. Soc. Bot. France, li (1904); Contrib. Fl. As. Orient. i. (1905), 199, pt. vi, fig. 29.

Planta 0·6–0·9 m. alta, tota pilis sericeo-velutinis (siccis) aureo-nitentibus vestita. Folia fere omnia basalia, longissime (30–35 cm.) petiolata; lamina ambitu fere rotunda, 10–13 cm. longa et lata, alte 5–7–fida, segmentis obovatis iterum fissis atque inciso-serratis, nervi primarii et secundarii subtus prominentes, dense velutini. Racemus angustus, simplex, vel basi ramis erectis 2–4 auctus; bracteae inferae partitae, mediae trifidae, supremae integrae flores novellos superantes. Flores subsessiles vel demum pedicello brevi aureo-velutino praediti, luride livido-violacei; perianthium ± pilosum vel pubescens. Cassis 2·2–2·5 cm. alta, basi 1·2 cm. lata in rostrum conspicuum progressa. Sepala lateralia circ. 1·2 cm. diamet., inferiora oblongo-ovata 1 cm. longa, 0·4 cm. lata. Petala calcare obtuso brevissimo et lamina linguiformi illo multo longiore nuda praedita 2–2·2 cm. longa. Carpella 3, ovarium parce pilosum.

"Plant of 2–3 ft. Flowers dull livid purple. Open, grassy mountain slopes on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. July 1906." G. Forrest. No. 2777.

This fine species of the *Lycoctonum* section is recognised by its conspicuously beaked hood, the obsolete spur of the petals, the nearly sessile flowers, and the golden hue of the whole plant.

Aconitum Bulleyanum, Diels. Sp. nov.

Planta fere glabra, circ. 1·2 m. alta. Caulis glaberrimus, nitidus, superne subvolubilis. Foliorum inferiorum petiolus 10–12 cm. longus, superiorum 6–7 cm. longus; lamina herbacea, in utraque facie glabra, 10–13 cm. longa, 15–20 cm. lata, alte 5–7–lobata, segmentis alte incisis, argute dentatis, dentibus mucronulatis, nervi in utraque facie (sicci), colore pallidi. Inflorescentiae ex axillis foliorum etiam inferiorum ortae, patentes, pauciflorae, 11–14 cm. longae; pedicelli subrectangulo-patentes vel refracti, 3–3·5 cm. longi. Sepala extus glabra, margine et intus pilosa, saturate violacea, cassis circ. 2 cm. longa, 1·2–1·5 cm. lata, basi linea obliqua truncata; sepala inferiora circ. 1·5 cm. longa. Petala usque 1·5–1·7 cm. longo et lamina 1 cm. longa emarginata praedita, calcare recurvato. Stamina glabra non dentata. Carpella 5 glabra.

"Plant of 4 ft. Flowers deep purple. Open situations on the margins of pine forests on the eastern flank of the Tali Range.

Lat. 25° 40′ N. Alt. 10–11,000 ft. September 1906." G. Forrest. No. 4372.

Allied perhaps to *A. Delavayi*, but distinguished by its glabrous leaves and flowers, by the dark colour of the flower and the glabrous carpels.

It is the same as "*Aconitum palmatum*, Don" (Delavay, No. 4242.)

Aconitum Souliei, Fin. et Gagnep. in Contrib. Flore As. Orient. i. (1905), 212, pt. ix, f. B. 3–5.

Flore violaceo.

"Pine woods at an altitude of 14,000 ft. On range between Chung tien plateau and Yangtse valley." Forrest. No. 270.

The leaves are more glabrous than in the type, and the flowers violet, not pale yellow as in Soulie's plant.

Aconitum transsectum, Diels. Sp. nov.

Caulis 0·9–1·6 m. altus, pubescens, superne ramosus. Folia infima tempore florendi evanida, inferiora petiolo circ. 5–7 cm. longo praedita, lamina 5–7–palmata, praeter nervos subtus pilosulos glabra, segmenta primaria ambitu anguste obovata alte pinnatifida, segmenta secundaria inciso-dentata dentibus breviter mucronulatis; segmentum primarium medianum circ. 8–9 cm. longum, 4–4·5 cm. latum, nervi principales subtus prominentes. Folia superiora brevius petiolata, cum illis ramorum demum fere sessilia. Rami floriferi inferiores arcuato-adscendentes; racemus terminalis ad 35 cm. longus. Flores breviter pedunculati, cum pedunculo extus minute pubescentes, pallidissime coerulei vel albescentes, margine intense coeruleo-tincti. Cassis ampla circ. 2–2·3 cm. lata et alta, latere infero linea rectissima truncata, apice rostro parvo praedita. Petala ungue circ. 1 cm. longo piloso instructa, calcare fere recto apice saccato atque lamina bifida ornata. Filamenta glabra. Carpella 3–4 sericeo-pilosa.

"Plant of 3–5 ft. Flowers very pale blue, almost white, with the margins of the perianth rich bright blue. Open mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 11–12,000 ft. August–September 1906." G. Forrest. No. 2868.

In habit, similar to *A. Kusnezoffii*, Rchb., and *A. Wilsoni*, Stapf, but distinguished by the petals which are not unlike to those of *A. ferox*, Wall., and remarkable by its very pale flowers, with a large hood, being truncate at the base by a completely straight line.

Aconitum brachypodum, Diels. Sp. nov.

Caulis basi nudus, 0·5–0·6 m. altus, superne pubescens. Folia conferta, brevissime (vix 1 cm.) petiolata, 5–7–partita, segmenta

iterum alte fissa, ultima linearia vel anguste triangularia, utrinque glabra, subtus pallidiora. Racemus 10–15 cm. longus. Pedunculi stricti, pubescentes, 2–3 cm. longi. Flores 3–3·3 cm. longi, 2–2·3 cm. lati, (ex collectore) " intense caerulei basin perianthii versus pallidiores." Sepala extus minute pilosula ; cassis mediocris conspicue curvata rostrata ; petala ungue circ. 2 cm. longo, lamina brevi, calcare parvo praedita. Staminum filamenta dentata. Carpella 5, ovarium (siccum) luteo-velutinum.

" Plant of $1\frac{1}{2}$–2 ft. Flowers bright blue, lighter towards base of perianth. Open, grassy situations in, and on the margins of, pine forests on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 3044.

The species is easily recognised by its short petioles, the curved and conspicuously beaked casket of the flower, and the dense velvet of the ovary.

This is close to part of *A. Napellum*, Linn., var. *sessiliflorum*, Fin. et Gagnep., as far as Soulié, No. 3034 of Yargong, and Soulié, No. 358 of Tizou, are concerned.

Aconitum venatorium, Diels. Sp. nov.

Caulis ex collectore 0·5–1 m. altus. Folia prope basin caulis conferta, longe (15–20 cm.) petiolata ; lamina utrinque glabra, subtus pallidissima, 10–12 cm. longa, 18–25 cm. lata, tripartita, segmenta primaria petiolulata vel saltem tenuissime contracta, iterum tri- vel quinquefida, segmenta ultima alte serrata serraturis ustulato-mucronulatis. Racemus simplex angustissimus, bracteatus, pubescens, ad 40 cm. longus, 4–4·5 cm. latus ; pedunculi stricti, erecti, cauli fere adpressi. Bracteae integrae, ovatae. Flores 2·5 cm. longi, 1·5 mm. lati. Sepala puberula, intense violacea. Cassis circ. 2·2–2·5 cm. alta, 1·4–1·6 cm. lata, apice breviter rostrata. Petala calcare parvo obtuso ornata. Stamina plerumque haud dentata. Carpella 5, ovarium pilosum.

" Open, grassy, rocky situations on the descent from the Ming-Kwong-Irrawadi divide towards Tsu-yu-ho, in the Irrawadi basin. Lat. 26° N. Alt. 9–10,000 ft. Upper Burma. October 1905." G. Forrest. No. 826. This is the species of *Aconitum* from the tubers of which is expressed the arrow poison in use by the Tibetans, Mossoo, Lissoo, Minchia, Lutzu, Chintzu, and other tribes of N.-W. Yunnan, and S.-E. China."

" Erect plant of $1\frac{1}{2}$–3 ft. Flowers deep violet purple. Moist, open hillsides, edges of scrub, etc. Irrawadi-Salwen divide. Lat. about 26° N. Alt. 8–11,000 ft. October 1905." G. Forrest. No. 883.

" Fragments of a plant collected and brought in by a Lissoo boy. Habitat, head of Ming Kwong valley in pine-woods ?

Not likely to be a cultivated specimen in such a country which is very wild. January 1906." G. Forrest. No. 1101.

This species is near to *A. acaule*, but differs by the harder, more deeply cut leaves, the smaller bracts, the shortly spurred petals, the less velvety ovaries, which are more narrowed at the top, and bear a longer style.

Aconitum acaule (Fin. et Gagnep. sub tit. var.), Diels.

Aconitum Napellus, L. var. *acaule*, Fin. et Gagnep. in Bull. Soc. Bot. France, li (1904); in Contrib. Fl. As. Orient. i. (1905), 209.

Caulis (ex collectore) 0·5–0·9 m., inferne glaber, superne minute velutinus. Folia 2–3 basi appropinquata, petiolo longissimo (circ. 20 cm.) praedita, media mox decrescentia, superiora bracteoidea, lamina inferiorum 8–12 cm. longa, 10–14 cm. lata, tripartita, segmenta lateralia iterum alte bifida, medium trifidum, omnia conspicue serrata, omnia subtus pallida, glabra vel praecipue ad nervos subtus elevatos pilosa. Racemus simplex vel basi ramis brevibus paniculato-auctus, bracteatus, velutinus, angustus, 12–30 cm. longus, 5–6 cm. latus. Bracteae (saltem superiores) oblongae, integrae, nonnunquam leviter coloratae. Flores circ. 3 cm. longi, 1·5–1·6 cm. lati. Sepala pubescentia, intense coerulea. Cassis circ. 2·5 cm. alta, angusta, apice rostrata. Petala apice obtusissima, haud calcarata, lamina brevi praedita. Stamina saltem interiora dentata. Carpella 5, ovarium (siccum) luteo-velutinum.

"Open mountain pastureland on the Tali Range to the west of Tali fu. Lat. 25° 40′ N. Alt. 9–10,000 ft. October 1904." G. Forrest. No. 280.

"Plant of 1–2½ ft. Flowers deep clear blue. Open, grassy ledges of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10,500–11,500 ft. October 1906." G. Forrest. No. 3089.

"Plant of 1½–3 ft. Flowers deep blue. Dry ledges, and at the base of cliffs in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. August–October 1906." G. Forrest. No. 4691.

The bracteate narrow raceme of medium-sized deep blue flowers, the beaked hood, the golden velvet of the ovaries are distinct features of this species.

ROSACEAE.

Sibiraea tomentosa, Diels. Sp. nov.

Frutex 0·6–1·2 m. altus. Rami juniores cortice fusco-purpureo obtecti, novelli tomentelli. Folia ad apices ramorum conferta,

coriacea, supra laevia glabra, margine et subtus cinereo-tomentosa nervis tomento occultis, oblanceolata, 5–7 cm. longa, 1·5–2·5 cm. lata, apice brevissime apiculata. Spicae confertae sessiles, ♂1·5–3 cm. longae densiflorae. Calycis tubus 1·5 mm. longus late infundibuliformis, lobi triangulares 2 mm. longi. Petala spathulata, calyce tenuiora, pallide ochroleuco-alba 2·5 mm. longa. Stamina circ. 20, circa 2 mm. longa. Spicae fructiferae 3–3·5 cm. longae. Carpidia 5 libera, ventre sub apice pilosa, ceterum glabra, laevia, lucida, brunnea.

"Shrub of 2–4 ft. Flowers pale yellowish-white. Moist, rocky situations in the bed of a stream on the eastern flank of the Lichiang Range. Lat. 27° 30′ N. Alt. 11,000 ft. Flow. et fruit. June 1906." G. Forrest. No. 2432.

Potentilla articulata, Franch., in Plant. Delavay. p. 210; Th. Wolf, Monog. der Gatt. Potent.—(Biblio. Bot. 71, 1908, p. 72.)

Ovarium glabrum; stylus subfiliformis subterminalis. Achaenia matura nondum exstant.

"Tufted plant of 1–2½ inches. Flowers bright canary yellow, shaded darker towards base of petals. Crevices and ledges of limestone cliffs in dry situations on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 12–13,000 ft. September 1906." G. Forrest. No. 2950.

The structure and insertion of the style confirms the affinity of this remarkable species to *P. biflora,* Willd.

Potentilla stenophylla (Franch.) Diels. Comb. nov. Franch. sub tit. var. in Plant. Delavay. (1889), 214.

Rhizoma crassum, collo stipulis amplis scariosis fuscis obtectum. Folia brevissime pedunculata vel subsessilia, pinnata, 5-8 cm. longa, 1·5–2·5 cm. lata, primo sericea demum praeter marginem ciliatum et dentes sericeo-barbatos glabrescentia; foliola numerosa subimbricantia, basi sessilia subcordato-rotundata, apice truncata dentibus 3 conspicuis subaequalibus ornata ceterum integra. Scapi praeter bracteas parvas nudi 8–10 cm. longi, saepe 1–2-flori. Calyx longe pilosus, sepala 4–5 mm. longa. Petala aurantiaco-flava, suborbicularia, 10 mm. diamet. Stamina 3·5–4 mm. longa. Receptaculum pilosum, carpella numerosa, glabra, ovarium 1 mm. longum; stylus ventralis subterminalis filiformis 2·6 mm. longus.

"Plant of 3–4 inches. Flowers orange-yellow. On ledges and in crevices of limestone cliffs on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. Flow. September 1906." G. Forrest. No. 2924.

Tsang chan (Delavay!).

This pretty *Potentilla* is related to *P. peduncularis*, Don, but is easily recognised by its low habit, the nearly sessile, very narrow leaves, tridentate leaflets, and short scapes. There are often only very few flowers.

6262 **Sorbus reducta,** Diels. Sp. nov.

Frutex humilis, 15–60 cm. altus. Rami adulti, cortice fusco vel cinerascente, sublucido tecti. Ramuli breves, apice folia circ. 3 atque inflorescentiam gignentes. Folia stipulis e basi lanceolata setaceis 3–4 mm. longis et petiolo 1–1·5 cm. longo praedita, rhachis pallide purpurascens anguste alata, foliola 4–6-juga, supra parce pilosa subtus glauca glaberrima, oblongo-elliptica, a medio ad apicem adpresse serrata serraturis apiculatis, 1·3–2 cm. longa, 0·5–0·7 cm. lata. Inflorescentiae parvae, 5–10-florae ; pedunculus 2-2·5 cm. longus, pilosulus et glabrescens. Calycis tubus latus, 3 mm. longus, glabrescens ; lobi triangulares, 1·5 mm. longi, apice purpurascentes, intus et margine lanuginosi. Petala alba, ex ungue brevi suborbicularia, 3–3·5 mm. longa et lata. Stamina brevia, 2 mm. longa, filamenta anguste triangularia. Styli 5, ima basi pilosula, 2·5 mm. longa.

" Small shrub of 6–24 inches. Flowers white. Forming underscrub in dense thickets and mixed woods on the eastern flank of the Lichiang Range. Lat. 27° 10′ N. Alt. 10,000 ft. Flow. June 1906." G. Forrest. No. 2238.

This species is easily recognised by its small size, small leaves, and few-flowered inflorescences.

6958 **Photinia Franchetiana,** Diels. Nom. nov.

Eriobotrya Griffithii, Franch., in Plant. Delavay. p. 224 (1889), non *Photinia Griffithii,* Dcne. Mém. Pom. 142.

Foliorum petiolus circ. 2·5 cm. longus, lamina coriacea, glaberrima, subtus pallida, obovato-elliptica vel obovata, 9–12 cm. longa, 4·5–7 cm. lata.

" Valley of the Yangtse below Chi Tien. Alt. 7000 ft. Tree of 15–30 ft. Yunnan. October 1904." George Forrest. No. 487.

Forrest's plant being in fruit I have not examined the flowers ; but the leaves are very glabrous and much broader than in *Photinia Griffithii,* Dcne., collected in Bhotan by Griffith. I think the latter is quite different from our Yunnan plant.

6562 **Cotoneaster verruculosa,** Diels. Sp. nov.

Frutex prostratus, 0·6–1·2 m. altus. Rami cortice cinereo sublucido tecti. Ramuli ultimi brunnei dense verruculosi, saepe hispidi, stipulisque lanceolatis longius persistentibus obtecti. Folia petiolo 2–5 mm. longo praedita, subcoriacea, parce pilosa demum glabrata, supra sublucida subtus pallida,

late elliptica vel suborbicularia, parva, 0·8–1·4 cm. longa, 0·7–1·2 cm. lata, nervi subtus obsoleti. [Flores non visi]. Drupa breviter pedicellata, (sicca) rubra 0·8–1 cm. longa.

"Prostrate shrub of 2–4 ft. Flowers white. On rocks and humus-covered boulders in dry situations, side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. June–July 1906." G. Forrest. No. 4427.

Habit of *C. horizontalis*, Decne, but differing in the verruculose branchlets with more persistent stipules, by the still more orbicular leaves, and the fruit being three times as large.

Cotoneaster hebephylla, Diels. Sp. nov.

Frutex divaricato-ramosus, 1·8–3 m. altus; rami cinereo-corticati, patentes, juniores purpurei sublucidi. Ramuli foliati florigerique nonnunquam tomentelli, ad 3 cm. longi, graciles. Folia breviter petiolata, decidua, primo pilosa demum glabrescentia, subtus glauca, elliptica vel saepius obovata, obtusa vel retusa, 1–2·5 cm. longa, 0·7–1·2 cm. lata, nervi subtus haud prominentes. Corymbi 6–16-flori, pedunculi et pedicelli pilosi demum glabrati. Calyx infundibuliformis demum glabratus, dentes late triangulares apice purpurei atque barbulato-ciliati. Petala alba, unguiculata, orbiculata, 3–4 mm. diamet. Antherae violaceae. (Fructus non visus.)

"Shrub of 6–8 ft. Flowers white. Open situations at the north end of the Chung-Tien plateau on the ascent of pass leading to the Yangtse valley. Lat. 28° N. Alt. 14,000 ft. September 1904." G. Forrest. No. 283.

"Spreading shrub of 6–10 ft. Flowers white, anthers violet. Moist, open situations on banks of stream at north end of the Lichiang valley. Lat. 27° 10′ N. Alt. 8500–9000 ft. May 1906." G. Forrest. No. 2110.

Allied to the *C. bacillaris*, Wall.; but the fruit being not yet known, I prefer to keep it distinct from that Western Himalayan species.

Cotoneaster insculpta, Diels. Sp. nov.

Frutex divaricato-ramosus, rami cortice atropurpurea praediti, novelli cinereo-pilosi; ramuli abbreviati foliati floriferique vix 0·5 cm. longiores. Folia breviter petiolata, persistentia, coriacea, supra glabra lucida, costa nervisque valde insculptis venisque subrugosa, subtus albo-tomentosa, margine anguste recurva, ovata, brevissime apiculata, 1·5–2·5 cm. longa, 1·2 cm. lata, nervi primarii circ. 4 utrinque a costa abeuntes. [Flores non visi.] Drupae (siccae) singulae, rubrae, 6–7 mm. diamet.

"Spreading shrub of 4–9 ft. Flowers white. On open, dry hillsides around Lu-chang, Salwin valley, Salwin-Irrawadi

divide. Lat. 26° N. Alt. 6–7000 ft. November 1903." G. Forrest. No. 800.

A similar plant was collected by Delavay (No. 2538).

Allied to *C. pannosa*, Franch., but the leaves more shining, with the nerves deeper sunk, and the flowers apparently mostly solitary.

RUBIACEAE.

Luculia gratissima, Sweet. Brit. Fl. Gard. t. 145. Hook. f. Fl. Brit. Ind. iii, p. 36 (1880).

This plant is very variable also in Yunnan. The difference between the typical species and *L. Pinceana*, Hook.f., is apparently not a specific one. Forrest collected the following forms :—

1. Inflorescence glabrous. Corolla lobes with a short erose appendage at each side close to the base.

"Spreading shrub of 4–10 ft. Flowers pale pink, corolla fleshy, deliciously fragrant, perfume same as apple blossom. Dry, open situations, slopes of the Salwin, Salwin-Irrawadi divide. Lat. 26° 15′ to 27° N. Alt. 5500–7000 ft. Forms a distinct belt. November 1903. The Chinese call it "Ting shan." G. Forrest. No. 967 partly ♂.

"Shrub of 6-20 ft. Flowers rose-pink, fragrant. Dry, open situations in the Lichiang valley. Lat. 27° 10′. Alt. 8–9000 ft. September 1906." G. Forrest. No. 2991 ♀.

"Shrub of 10–30 ft. Open situations in mixed thickets on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 6700–8000 ft. July–September 1906." G. Forrest. No. 4698 ♂.

2. Inflorescence hairy, ovary whitish-tomentose. Corolla lobes with a short erose or fimbriate appendage at each side close to the base.

"Dry, open situations, slopes of the Salwin, Salwin-Irrawadi divide. Lat. 26° 15′ to 27° N. Alt. 5500–7000 ft." G. Forrest. No. 967 partly ♀.

"Dry hillsides amongst scrub. Valley of the Salwin between Hsia-Ku Ti and Ya-Ko, Salwin-Irrawadi divide. Lat. 26° 30′. Alt. 5–7000 ft. November 1903." G. Forrest. No. 1027.

Leptodermis Forrestii, Diels. Sp. nov.

Frutex ramosus, 0·6–1·2 m. altus. Ramuli basi nudi, antrorsum foliati. Folia breviter petiolata stipulis obtusis vel truncatis glanduloso-fimbriatis praedita membranaceo-herbacea, supra sparse strigosa, subtus glabra glaucescentia, 1·5–2·5 cm. longa, 1–1·2 cm. lata. Flores ad apices ramulorum solitarii, ampli, basi stipulis foliorum 2 plerumque laminatorum liberis tecti. Calycis glaberrimi tubus 2 mm. longus, segmenta lanceolata,

subrigida, acuta 2 mm. longa. Corolla colore lavendulaceo vel saturate roseo ornata; tubus glaber 13–15 mm. longus, lobi segmenta supra pilosa, eroso-dentata, 7 mm. longa et lata, expansa. Stamina 3 mm. longa. Styli 12 mm. longi, rami 2–3 dense papillosi.

"Shrub of 2–4 ft. Flowers rose-lavender, drying black. Open, shady situations on the margins of mixed forests on the eastern flank of the Lichiang Range. Lat. 27° 12′. Alt. 9500–10,000 ft. Flow. June 1906." G. Forrest. No. 2382.

"Branching shrub of 4–6 ft. Flowers pure lavender, non-fragrant. Very shady situations in a deep side valley on the eastern flank of the Lichiang Range. Lat. 27° 20′. Alt. 11,000 ft. Flow. June 1906." G. Forrest. No. 2403.

This is easily recognised in the genus by its large solitary flowers and the 2–3-branched style.

Leptodermis glauca (Franch.), Diels. Sp. nov.

Hamiltonia glauca, Franch., ms. in schedis.

Frutex 0·3–0·6 m. altus. Rami cortice brunneo obtecti, ramuli numerosi foliati floriferique breves, vix 1·5 cm. longiores. Folia ad petiolum perbrevem ciliata, ceterum glabra, subtus glaucescentia, elliptica obovato-elliptica vel oblonga, nonnunquam 1·5 cm. longa, 0·7 cm. lata sed plerumque minora, obtusa vel brevissime apiculata, nervi haud prominuli; stipulae minutae. Cymae terminales, plerumque 3-florae, subsessiles. Bracteolae minutae, liberae, ciliatae, calyci appropinquatae. Calyx praeter dentes ciliatos glaber, tubus 2–2·5 mm. longus, dentes triangulares ca. 0·8 mm. longi. Corolla lavandulacea, 7–9 mm. longa, tubus gracilis, glaber, sensim ampliatus, lobi suborbiculares intus puberuli, 4 mm. longi et lati, parte mediana lanceolata apice apiculata, a partibus lateralibus tenuioribus margine subcrispata diversa.

"Shrub of 1–2 ft. Flowers lavender. Dry, stony situations on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–9000 ft. June–July 1906." G. Forrest. No. 4796.

Collected before in the same neighbourhood by Delavay.

The species is recognised by its glaucous leaves and the very small bractlets, which are nearly free.

Leptodermis Wilsoni, Hort. Kew ex Herb. Kew.

Frutex. Rami cortice brunneo obtecti, ramuli foliati floriferique abbreviati 4–5 cm. longi. Folia petiolo 0·3–0·5 cm. longo praedita, lamina herbacea, ovata vel obovato-elliptica, subtus pallidiora, praeter costam fere glabra, 1·5–2·5 cm. longa, 0·6–1·2 cm. lata, nervi non prominuli. Cymae ad apices ramulorum plerumque triflorae. Bracteolae 1·5–2 mm. longae, ± connatae,

apiculatae, pallidae, subscariosae. Calycis tubus ca. 2·2 mm. longus, dentes anguste triangulares, 1·2 mm. longi. Corolla lilacina, tubus 10–12 mm. longus, lobi subexpansi, suborbiculares, 4–6 mm. longi, 4–5 mm. lati, parte mediana apice calloso-apiculata puberula a lateribus tenuioribus margine undulato-erosis minus diversa.

"Shrub of 4–6 ft. Flowers soft lavender. Shady situations on the margins of mixed forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. July–August 1906." G. Forrest. No. 4789.

"Mekong-Salwin divide behind Tsekou Mission. Tibet. 1904." G. Forrest. No. 580.

"Valley of the Mekong between Yeh Chih and Bati. Alt. 6–7000 ft. Tibet. 1904." G. Forrest. No. 367.

Nearly allied to *L. glauca* (Franch.), Diels, but the leaves are larger and not so glabrous, the bracteoles larger and more connate, the corolla larger.

3119 **Leptodermis pilosa** (Franchet), Diels. Sp. nov.

Hamiltonia pilosa Franchet, ms. in schedis.

Frutex 1·5–3 m. altus. Rami brunneo-corticati, juniores purpurei novelli ± puberuli. Folia remota, breviter petiolata, herbacea, in utraque facie pilosa, subtus pallida, ovata, 1·5–2·5 cm. longa, 1–1·5 cm. lata, nervi subtus prominuli; stipulae patulae subscariosae pallide fuscae, e basi lanceolata longe acutae, ca. 2·5 mm. longae. Cymae in ramulis abbreviatis axillares atque terminales confertae. Bracteolae connatae, late ovatae, scariosae, nervosae, conspicue mucronatae, 2·5 mm. longae, ciliatae calycem tegentes. Calycis tubus ca. 1 mm. longus, segmenta lata, subtruncata, ciliata, 1 mm. longa. Corolla lilacina, ± papilloso-tomentella, tubus 10 mm. longus, limbus parvus, lobi suberecti 2·5 mm. diamet. Capsula anguste ovoidea, bracteolis duplo longior, atrofusca, nitida.

"Base of hills, Hoching and Lichiang valleys, and other places. Alt. 7–10,000 ft. Shrub of 5–10 ft. Flowers lilac, sometimes white. September 1904." G. Forrest. No. 581.

"Much branched shrub of 5–8 ft. Flowers lavender, drying black. Open, dry and moist situations on the Lichiang plain along the base of the Lichiang Range. Lat. 27° N. Alt. 8500–9000 ft. August 1906." G. Forrest. No. 2731. This specimen is more glabrous than No. 581. Collected before near Tali (Delavay, No. 146).

Allied to *L. Griffithii*, Hook.f., of the Khasia Hills, but more hairy, the stipules spreading, the calyx teeth ciliate and much broader.

Rubia pallida, Diels. Sp. nov.

Caules flaccidi, ramosi, uncinato-scabri. Foliorum (superiorum) petiolus quam lamina plerumque longior 0·7–2 cm. longus scabridus, lamina ad marginem costamque scabra, ovata vel lanceolata, acuminata, 0·6–1·2 cm. longa, 0·25–0·4 cm. lata. Corymbuli axillares pedunculati, pedicelli 3–4 mm. longi. Corolla (an albida?) alte 5–loba, tubus perbrevis, segmenta subovata, acuminata, 2–2·5 mm. longa, 1 mm. lata, obsolete trinervia. Stamina brevia. Styli 2 liberi, 0·2–0·3 mm. longi. Fructus niger, (siccus) 4 mm. diamet.

"Valley of the Yangtse between Chin Tien and Shih Ku, Yunnan. Alt. 6–7000 ft. September 1904." G. Forrest. No. 40.

Recognised by its long-petioled leaves with a small lamina, the pale flowers, the very short tube of the almost rotate corolla.

Rubia leiocaulis (Franch., sub tit. var.), Diels. Sp. nov.

Rubia cordifolia, Linn. var. *leiocaulis,* Franch., ms. in schedis.

Caules semiscandentes, 0·3–1·2 m. alti, laeves, fere glabri. Foliorum (superiorum) petiolus 1·5–2 cm. longus, lamina praeter marginem nervosque parce scabridos glabra, e basi cordata elongato-ovata, acuta, trinervis, 4–5·5 cm. longa, 2–3 cm. lata. Inflorescentiae pedunculatae axillares terminalesque foliis breviores. Corolla viridis, tubus breviter cupuliformis, 0·8 mm. altus, 3–3·5 mm. latus, segmenta limbi stellato-expansa, ovata, apice contracto-acuminata, 2·3–2·5 mm. longa. Styli 0·7 mm. longi, ad medium fere connati.

"Semi-scandent plant of 1–4 ft. Flowers green or reddish. Dry, open situations amongst scrub on eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–9000 ft. May–August 1906." G. Forrest. No. 4635.

Was collected before in the same neighbourhood "ad basin montis Tsang chan," by Delavay.

Allied to *R. chinensis,* Regel.

Rubia podantha, Diels. Sp. nov.

Caulis semiscandens, 0·4–1·2 m. altus, cum petiolis nervisque foliorum retrorso-scabridus. Folia 4–na, petiolus rigidus, strictus, patens, 3–5 cm. longus; lamina e basi cordata lanceolata, acuta, subtus rubescenti-glauca, nervis et margine albido-scabrida, 6–8 cm. longa, 2–2·5 cm. lata. Inflorescentia laxa, pedunculi stricti, rigidi, 2–20 mm. longi. Flos fusco-purpurea, corolla altius patelliformis, segmenta triangularia, carnosa, crassiuscula, 2·5 mm. longa, antrorsum recurva apice callosa pallida. Stylus crassus bifidus.

"Semi-scandent plant of 1½–4 ft. Flowers brown crimson. Dry, stony situations amongst scrub on the eastern flank of the Lichiang Range. Lat. 27° 10′. Alt. 9–10,000 ft. June 1906." G. Forrest. No. 2327.

"Plant of 1–3 ft. Flowers reddish purple. Moist, shady situations amongst scrub on and at the base of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 10′. Alt. 9–10,500 ft. Flow. August 1906." G. Forrest. No. 2753.

This form was collected before by Delavay (No. 2591) "ad montem Hee-chan-men," and named by Franchet *R. cordifolia*, L. var. *purpurea* L. = *R. purpurea*, Decne., f. b.

Rubia yunnanensis (Franch.), Diels. Sp. nov.

Rubia sikkimensis, Kurz, var. *yunnanensis*, Franch., ms. in schedis.

Planta e basi ramosa, 7·5–20 cm. alta, rami adscendentes. Folia 4-verticillata, sessilia, crassiuscula, margine scabrida, subtus pallida, anguste ovata vel oblonga, 8–12 mm. longa, 3–4 mm. lata, inferiora vix majora, nervi 3 primarii supra immersi, subtus prominentes. Inflorescentia terminalis subpaniculata. Flores breviter pedicellati. Corolla patelliformis lutea, segmenta anguste ovata, patula, apice ipsa subcallosa incurva.

"Prostrate plant of 3–8 inches. Flowers yellow. Dry, stony, barren pastureland along the base of foothills to south of the Lichiang Range. Lat. 27° 5′ N. Alt. 8–8500 ft. June 1906." G. Forrest. No. 2484.

"Maeulchan in collibus calcareis. Delavay! *R. sikkimensis*, Kurz, var. *yunnanensis*, Franch.

This species has a Galium-like habit. It is nearly related to *R. ustulata*, Diels, but is distinguished by its smaller size, the much more equal and smaller leaves, the cuspidate petals. It is quite different from *R. sikkimensis*, Kurz.

Rubia ustulata, Diels. Sp. nov.

Caulis suberectus vel debilis, parce ramosus, 25–30 cm. longus, fere glaber. Folia 4-verticillata subsessilia praeter basin ipsam puberulam glabra, late elliptica vel obovata, inferiora circ. 4 cm. longa, 2 mm. lata, trinervia, superiora mox decrescentia. Inflorescentia subterminali-paniculata gracilis, bracteae minutae purpurascentes. Flores striolati. Corolla patelliformis, demum rotato-stellata; petala ovata, obtusiuscula, nec recurva, 1·6–2 mm. longa, sicca albida apice ustulato-purpurascentia. Styli 2, 0·6 mm. longi, graciles.

"Dry, rocky situations and pine woods in all valleys north of Talifu. Alt. from 6500–10,000 ft." G. Forrest. No. 365.

"Mekong-Salwin divide behind Tsekou Mission," G. Forrest. No. 368. Tsekou, Monbeig in Herb. Kew!

Rubia membranacea (Franch., sub tit. var.), Diels. Sp. nov.

Rubia cordifolia, Linn. var. *membranacea*, Franch., ms. in schedis.

Caulis 0·3–0·9 m. altus, sparse retrorso-scabridus. Folia 4–na, petiolo 0·5–2 m. longo praedita ; lamina membranacea-herbacea, parva, e basi cordata vel rotundata lanceolata, acuta vel acuminata, 1–6 cm. longa, 0·5–1·5 cm. lata. Inflorescentiae axillares et terminales, 2–3 cm. longae. Pedicelli 1–3 mm. longi. Corolla rotato-stellata, fere ad basin 5–partita ; segmenta expansa haud incurva, 1·5–1·8 mm. longa, ovata, apice tenuiter acuminata, rubro-purpurascentia. Styli 2 breves, stigmata capitata.

" Plant of 1–3 ft. Flowers reddish purple. Dry, stony situations on the margins of pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. Flow. August 1906." G. Forrest. No. 4639.

The same species was collected before by Delavay " in silvis montis Lan-ho-kien, 12 July 1889," and named by Franchet as " *R. cordifolia*, Linn var. *membranacea*."

Galium Forrestii, Diels. Sp. nov.

Caulis quadrangulus, strigoso-pilosus, 15–25 cm. altus, vix ramosus. Folia 4–na, brevissime petiolata vel subsessilia, ovato-elliptica, supra strigosa, subtus strigosa et glandulis flavis praedita, 8–12 mm. longa, 3–5 mm. lata uni- vel obsolete 3–nervia. Inflorescentia terminalis e corymbis laxifloris pedunculatis effecta. Flores viridulo-lutei sicci fusci, gracillime pedicellati. Receptaculum densissime setuloso-pilosum (siccum deinde albidum). Corollae segmenta subovata apiculata 1·3 mm. longa. Styli 2 divaricati apice capitati.

" Plant of 6–10 inches. Flowers greenish-yellow. Dry, stony situations in bed of stream at base of eastern flank of the Lichiang Range. Lat. 27° 10′ N. Alt. 10,000 ft. Flow. June 1906." G. Forrest. No. 2363.

Allied to *G. serpylloides*, Royle, of the Western Himalaya, but stems more strict, less branched, leaves more remote, cymes longer, pedunculate and pedicels more slender.

Galium nephrostigmaticum, Diels. Sp. nov.

Caulis vix ramosus 20–40 cm. altus, quadrangulus, strigoso-pilosus. Folia 4–na, basin et apicem versus minora, subsessilia, late ovata vel obovata, obtusa, utrinque strigoso-pilosa deinde cinerascentia, ad 15 mm. longa et 7·5 mm. lata, e basi trinervia. Inflorescentia terminalis e corymbis multifloris pedunculatis effecta. Flores demum breviter pedicellati viridulo-lutei. Calyx glaber vel raro scabridulus. Segmenta (nonnunquam 5) cordato-

ovata, obtusa, striolata. Styli 2 subsessiles ad stigmata subreniformia fere reducta.

"Plant of 9–16 inches. Flowers greenish-yellow. Dry pasture-land on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. Flow. June–August 1906." G. Forrest. No. 4638.

From specimens seen in the Paris and London herbaria, this species seems to be fairly widely distributed in Yunnan.

Galium modestum, Diels. Sp. nov.

Caules graciles, debiles, ramosi 5–15 cm. longi. Folia 3–5 na sessilia, anguste oblanceolata, praeter costam subtus parce scabridulam glabra, 3–5 mm. longa. Cymae ad apices caulis atque ramulorum terminales triflorae. Flores pedicellati, pedicelli deflorati conspicue elongati strictiusculi. Petala ovata obtusiuscula tenere 3-nervia alba striolata 1–1·5 mm. longa. Styli 2 subinaequales.

"Plant of 2–6 inches. Flowers white. Dry pine forests on the Namti-Shweli divide. Lat. 25° N. Alt. 7–8000 ft. March 1906. W. Yunnan." G. Forrest. No. 4978.

Very similar to *G. trifidum,* Linn., but the corolla is larger, the petals three-nerved, and the styles unequal.

RUTACEAE.

Xanthoxylum usitatum, Diels. Sp. nov.

Frutex aculeatus 1·8–3 m. altus. Rami nigri. Folia herbacea, ad rhachin nervosque minute aculeolata, glabra, 3–5-juga, 3–4·5 cm. longa, 2–2·5 cm. lata; rhachis haud alata. Foliola arcte sese tegentia, inferiora minora, subovata, obsolete crenata, ad crenaturas glandula ampla praedita, majora 1–1·5 cm. longa, 0·6–0·9 cm. lata. Flores ♀: Cymulae pedunculatae, 3-florae, fasciculatae, 0·8–1·5 cm. longae, ad rhachin minute puberulae. Pedicelli 2–3 mm. longi. Tepala lanceolata, acuminata, 2·5 mm. longa, 0·8 mm. lata. Gynophorum 1–1·5 mm. longum. Ovarium 1 mm. longum, styli 1–1·5 mm. longi.

"Spinous spreading shrub of 6–10 ft. Fruit a red greasy capsule 1 × 1½ lines, containing one or two seeds. Bitter and biting, but aromatic, and used as a condiment by the Chinese. Dry, open, stony situations in side valleys on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 9–11,000 ft. May 1906." G. Forrest. No. 2103.

Allied to *X. piperitum,* DC., but the leaflets are fewer in number, not so conspicuously serrate. Another undescribed species of the same group is Wilson, No. 3310.

SALICACEAE.

Salix resecta, Diels. Sp. nov.

Frutex 1·2–1·8 m. altus. Rami cortice subnitido tecti, apice ramulosi. Folia breviter petiolata, pilosa, novella praecipue ad costam pilosa, supra subnitida, subtus valde glauca, elliptica vel oblonga, basi obtusa, apice obtusa vel breviter acuminata, *e.g.* 2·5 cm. longa, 1·3 cm. lata. Amenta ♀ subsessilia, densiflora (nonnisi fructifera visa). Bractea pilosa capsulae dimidium aequans apice conspicue truncata. Glandula anguste conica, 0·7–0·8 mm. longa. Capsula subsessilis, tenuiter sericea, conico-ovoidea, 1·5–3 mm. longa. Styli 2 integri, circ. 1–1·2 mm. longi.

"Shrub of 4–6 ft. Flowers greenish-yellow. Moist situations on the margins of thickets on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9000 ft. July 1906." G. Forrest. No. 4602.

Allied to *S. longiflora*, Anderss., and *S. cathayana*, Diels, but the leaves are shorter and more glaucous beneath, the capsule narrower and silky, the bracts sharply truncate, the gland narrow, the styles longer.

Salix cathayana, Diels. Sp. nov.

Frutex 0·6–1·5 m. altus, ramosissimus. Rami cortice brunneo vel cinereo praediti, novelli pubescentes. Folia (nonnisi novella visa) petiolo costaque pubescentia ceterum glabra, subtus glaucescentia, oblonga, margine integra. Amenta ♀ anguste cylindrica, brevissime pedunculata, densiflora, 2–3·5 cm. longa, rhachis cinereo-pilosa. Bractea fusca, late obovata, obtusa, pilosa, 1·2 mm. longa. Glandula ovata, bracteae dimidium vix aequans. Ovarium ellipsoideum, glabrescens, circ. 2 mm. longum. Styli breves apice brevissime bifidi.

"Shrub of 2–5 ft. Flowers green. Moist, rocky situations by streams in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. June 1906." G. Forrest. No. 4600.

Mosoyn, 4 April 1887 (Delavay, "*S. longiflora*, Anderss." Franch. in Herb. Paris).

The differences of this species from *Salix longiflora*, Anderss., of the Sikkim Himalaya, are obvious. The ♀ catkins are very dense, not pendulous, the bracts pale, the rhachis more hairy.

SAXIFRAGACEAE.

Parnassia mysorensis, Heyne, var. **aucta,** Diels. Var. nov.

Folia 1·5–2 cm. longa et lata. Caulis ad 20 cm. altus. Petala emarginata, circ. 1–1·2 cm. longa, apice 0·5–0·6 cm. lata.

"Plant of 4–7 inches. Flowers white. Moist, mountain pasture-land on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. August 1906." G. Forrest. No. 5042.

A larger plant than the type, but otherwise hardly different.

Chrysosplenium Forrestii, Diels. Sp. nov.

Radicis fibri incrassati. Scapi basi squamis fuscis praedita. Folia basalia solitaria, longe (6–8 cm.) petiolata. Scapi glabri, 12–16 cm. alti, non nisi apice foliati. Folia caulina alterna petiolo 0·5–0·8 cm. longo praedita, glaberrima, orbiculari-reniformia, basi alte cordata, margine crenata crenaturis truncatis vel leviter emarginatis, nonnunquam margine callosis, 1·5–1·8 cm. longa, circ. 2·5 cm. lata; suprema decrescentia, lutescentia. Inflorescentia compacta. Flores subsessiles flavi, sepalis concavis cupuliformes. Sepala reniformia vel late elliptica, tenera, 1·5 mm. longa, 2·5–3 mm. lata. Stamina 8 perigyna.

"In moist places, on roots of trees, wet rocks, and shady situations. Alt. 9–12,000 ft. Niu Chang Pass, Yunnan. 1904." G. Forrest. No. 553.

This is a third species of the *Alternifolia*, ser. *Incisa* (of Franchet's Monograph), which differs from *C. Griffithii* by its more compact inflorescence with less divaricate branches, the much shorter lobes of the leaves which are deeply cordate, the smaller, more campanulate flowers, and the slenderer sepals, which are yellow (not green) and not spreading. From *C. nudicaule*, Bge., to which it seems to be nearest, of North-eastern Asia (and Kansu), it differs by its larger size, the smaller crenatures of leaves and the texture and colour of the sepals.

SCROPHULARIACEAE.

Veronica Forrestii, Diels. Sp. nov.

Caules decumbentes reptantes, basi ramosi atque stoloniferi, superne villoso-pilosi. Folia in petiolum 5 mm. longum basi rursus ad 2·5 mm. dilatatum villoso-ciliatum angustata, subcoriacea, glabra, subtus pallidiora saepe purpurascentia, anguste ovata vel oblonga, antrorsum leviter serrata vel fere subintegra, 1–2 cm. longa, 0·5–0·8 cm. lata, nervi praeter costam obsoleti. Racemi pedunculati, erecti vel adscendentes, terminales vel axillares 4–8 cm. longi; pedunculi puberuli 2–5 cm. longi, pedicelli 3–8 mm. longi, glanduloso-puberuli. Sepala oblonga vel lanceolato–oblonga, 3 mm. longa demum ad 5 mm. increscentia, glanduloso-puberula. Corolla ad 12 mm. diamet., ad faucem pilosa. Capsula oblique rhomboidea, apice emarginata, pilosula, (immatura) quam sepala brevior.

" Procumbent plant of 6–15 inches, flowers reddish. Dry, open situations amongst rocks on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. W. Yunnan." G. Forrest. No. 4195.

Scrophularia Forrestii, Diels. Sp. nov.

Caulis erectus, 0·3–1·2 m. altus, pubescens, basi parce ramosus. Foliorum inferiorum petiolus pubescens, 3–4 cm. longus, lamina membranaceo-herbacea in utraque facie pilosula, late ovata argute serrato-dentata, dentibus iterum serrulatis, 4–7·5 cm. longa, 4–6 cm. lata, nervi laterales primarii circ. 3–4 utrinque a costa abeuntes. Corymbi laxiflori, in foliorum superiorum axillis orti, thyrsum elongatum angustum efficientes ; pedunculus communis 7–12 mm. longus, pedicelli glanduloso-hirti 5–7 mm. longi. Sepala late ovato- vel obovato-rotundata, 3 mm. diamet. Corolla viridis ; tubus 5–6 mm. longus, 4–4·5 mm. latus, labii superi 2·5–3 mm. longi, 3·5 mm. lati lobi 2 lati, labii inferi lobi circ. 1 mm. longi. Staminodium reniformi-subrhombeum, 1·5 mm. latum. Stamina glanduloso-hirta, 2–2·2 mm. longa. Ovarium late ovoideum, 2·5 mm. longum et latum ; stylus 2·5 mm. longus.

" Erect plant of 1–4 ft. Flowers green. Common inside the city of Teng Yueh growing in shady places. Very local. Lat. 25° N. Alt. 5600 ft. October 1905." G. Forrest. No. 990.

Allied to *S. diplodonta,* Franch., but this is more hairy, the leaves not as broad, the teeth less deep, the corolla longer.

SOLANACEAE.

Lycium chinense, Mill. var. ?

Habitu a planta typica longe recedit. Rami primarii defoliati. Folia ad nodos conferta vel in ramulis secundariis 6–8 cm. longis strictis gracilibus sparsa, quam ea plantae typicae minora atque teneriora 0·5–1·5 cm. longa. Flores typici sed minores atque lilacini.

" Spreading shrub of 2–4 ft. Flowers heliotrope. Rocky, moist situations below high-water level, banks of the Salwin, Salwin-Irrawadi divide. Only at one place, near Chong-wa. Lat. 26° 45′ N. Alt. 3200 ft. November 1905." G. Forrest. No. 952.

This specimen has a very curious habit. I have never seen anything like it from other localities where *L. chinense* is known to grow. But the modification may be due to the plant being subject to periodical inundation. Forrest saw it only once (v. supra !).

TERNSTROEMIACEAE.

Thea Forrestii, Diels. Sp. nov.

Frutex 1–3 m. altus. Rami graciles, novelli pubescentes. Folia breviter petiolata, chartacea, supra sublucida subtus pallidiora, praeter petiolum costamque pilosam glabra punctulata, ovata vel rarius sublanceolata, obtuse acuminata, minute adpresse serrata, 2·5–3 cm. longa, 1·2–1·8 cm. lata, nervi subtus vix conspicui. Pedunculus brevissimus bracteolis coriaceis parvis praeditus. Sepala coriacea, late ovata, margine ciliata praeterea glabra, 2–4 mm. longa; petala ochroleuca, late elliptica, apice obtusa vel leviter emarginata, 8–9 mm. longa, 5–7 mm. lata. Stamina basi coalita ca. 6 mm. longa. Ovarium glabrum, stylus glaber, 8 mm. longus, apice in ramos 3 solutus.

"Shrub of 3–8 ft. Flowers creamy white. Wooded gullies. South end of Tsu-hsiong-fu valley. Alt. 7–8000 ft. Yunnan. February 1903." G. Forrest. No. 314.

Closely allied to *T. euryoides* (Lindl.), Booth, but different from it by thicker, broader, more glabrous leaves, more glabrous sepals and emarginate petals. Another closely allied species is *T. microphylla*, Pitard, from the Yunnanfu region; from this our species may be recognised by its nearly doubly larger leaves, which are not as thick, and do not get as yellow when dry.

Thea yunnanensis, Pitard.

Frutex 1–3 m. altus. Rami graciles, novelli pubescentes, adulti cinereo-corticati. Folia breviter petiolata, papyracea, supra fere glabra, subtus (et ad petiolum) praecipue ad costam pilosula, subtus pallidior, ovata vel ovato-lanceolata, basi rotundata vel cito angustata, apice acumine saepe subobliquo vel subcurvato praedita, serrulata, 3–5 cm. longa, 1·7–2·5 cm. lata, nervi vix conspicui. Flores breviter pedunculati (demum quidem), erecti, expansi (sicci) 5 cm. diamet. Sepala margine scariosa; petala alba, elliptica, 2–2·5 cm. longa, 1–1·3 cm. lata, haud emarginata. Stamina non nisi basi coalita, 1–1·5 cm. longa. Ovarium glabrum, styli liberi.

"Shrub of 4–8 ft. Damp places on hillsides. Head of Lang Kung valley. Alt. 9000 ft. Yunnan. 1904." G. Forrest. No. 430.

Ta long tan, 15 October 1889 (Delavay!).

In habit, this approaches *T. Greysii* or *T. rosiflora*. It is difficult to decide whether it should be included in Sect. *Euthea* or in Sect. *Camellia*.

Thea speciosa, Pitard.

Frutex 1–2 m. altus. Rami novelli brunnei, adulti cinereo-corticati. Folia breviter petiolata, coriacea, in utraque facie lucida, subtus pallidiora glaberrima (sicca) punctulata, ovato-oblonga vel oblanceolata, basin versus plerumque sensim angustata, calloso-serrata, apice acuminata, 4·5–10 cm. longa, 2·5–3·5 cm. lata, nervi sicci supra magis quam subtus conspicui. Sepala rotundata, dorso dense sericea, 1–1·5 cm. longa, 1·5–2 cm. lata; petala rosea, emarginata, ad 4 cm. longa et 3·5 cm. lata. Stamina varie (usque ad $\frac{2}{3}$) coalita, ad 2·5 cm. longa. Ovarium dense pilosum, styli usque ad apicem connati, 2–2·5 cm. longi.

"Shrub of 3–6 ft. Flowers rose-pink. On dry, open, chalky hillsides from Yunnanfu to Tsu-hsiong-fu. Alt. 7–8000 ft. January 1903." G. Forrest. No. 423.

Pinfa, Kong-tchou (Cavalerie et Fortunat, No. 2261. Type, Bodinier, No. 2594).

Tchen fong chan, Yunnan, Fevrier, 1904 (Delavay, No. 4930).

Allied to *T. Sasanqua,* but larger; the stamens are connate very high up.

TILIACEAE.

Tilia paucicostata, Maxim., var. **yunnanensis,** Diels. Var. nov.

Folia in axillis nervorum ferrugineo-barbata atque praeterea pilis mollibus densius vestita.

"Sides of streams, Shu Pa and Lopa valleys, Yangtse-Mekong divide, between Pung-tzu-la and Hsia Zo. Alt. 9–10,000 ft. September 1904." G. Forrest. No. 47.

THYMELAEACEAE.

Daphne aurantiaca, Diels. Sp. nov.

Frutex humilis, ramosissimus, 0·6–1·2 m. altus, rami foliorum pristinorum vestigiis quasi verrucosi. Folia ad apices ramulorum conferta, parva, subchartacea, laevia, glabra, subtus pallidiora, obovata, vel elongato-obovata, acuta, margine subrecurva, 9–10 mm. longa, 4–5 mm. lata, costa supra insculpta subtus prominens, nervi ceteri inconspicui. Flores 2–4-ni terminales sessiles, glabrati, intense aurantiaci, fragrantes; tubus 10–12 mm. longus, lobi ovato-elliptici obtusi, nonnunquam inaequales, 4–5 mm. longi, 3–3·5 mm. lati. Ovarium glabrum, elongato-obovatum, 2–3 mm. longum, stylus perbrevis vix 0·5 mm. longus, stigma capitatum 0·7 mm. diamet.

"Dwarf shrub of 2–4 ft. Flowers bright orange yellow,

fragrant. In crevices of limestone cliffs on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 10–12,000 ft. May 1906." G. Forrest. No. 2115.

A very distinct species, apparently not much allied to any other *Daphne* of the region.

Wikstroemia holosericea, Diels. Sp. nov.

Frutex 0·3–1 m. altus, ramosissimus, ramuli apice dense foliati. Folia sessilia, utrinque dense sericeo-pilosa, albido-nitentia, linearia vel oblanceolato-linearia, margine revoluta, 1–1·5 cm. longa, 1·5–2·5 mm. lata. Flores terminales, complures, sessiles, inter folia summa occulti, lutei. Perianthium 5–merum, extus densissime sericeum, intus glabrum; tubus 4–5 mm. longus, 2 mm. latus, limbi lobi 5, subovati vel triangulares, 2 mm. longi. Antherae 0·7 mm. longae. Ovarium anguste conico-ovatum, apicem versus pilosum, 2·5 mm. longum, stigma glabrum. Discus nullus. Seminis testa aterrima nitida.

"Descent of the Yangtse from Chung Tien, between Tang Tui and Chiao Tou. Dry, hilly country. Alt. 10,000 ft. Yunnan. September 1904." G. Forrest. No. 13.

Easily recognised in the genus by its silky tomentum.

Wikstroemia dolichantha, Diels. Sp. nov.

Frutex 0·6 m. altus ramosus, rami adulti purpurascentes, juniores cinereo-sericei. Folia brevissime petiolata, subherbacea, glaucescentia, subtus pallidiora, parce pilosa, oblonga vel oblanceolato-oblonga, breviter acuminata, 2·5–3 cm. longa, 0·8–1 cm. lata. Spicae pedunculatae, sericeo-pubescentes, paniculam gracilem formantes. Flores subsessiles, lutei, tubus anguste cylindricus, extus sericeo-pubescens, 8–9 mm. longus, limbi lobi 5 circ. 1·2–2 mm. longi. Squama disci unica lineari-lanceolata margine incisa 2–2·5 mm. longa. Ovarium subclavatum, 3–4 mm. longum antrorsum pilosulum, stigma capitatum.

"Shrub of 2 ft. high. Flowers yellow. Rocky hillsides, Chien chuan and Hoching valleys. Alt. 7–9000 ft. Yunnan. September 1904." G. Forrest. No. 133.

In habit, this is similar to *W. Chamaedaphne,* Meissn., but the flowers are much more slender. Also *W. linoides,* Hemsl., is allied to it, but is a much weaker plant, with glabrous flowers.

Wikstroemia scytophylla, Diels. Sp. nov.

Habitu praecedenti similis, sed rami foliaque glaberrima. Folia superiora saepe opposita, coriacea, oblanceolata, brevissime acuminata, 3–6 cm. longa, 1–1·2 cm lata, nervi a costa angulo acuto abeuntes, subtus (sicci) obsoleti. Spicae (an semper?) solitariae, haud paniculatae. Flores breviter pedicellati, glabri,

lutei, tubus ad 10 mm. longus, limbi lobi 5 nonnunquam minute denticulati, 1·5–2 mm. longi. Squama disci unica linearis. Ovarium praecedentis.

"Dry, limestone hills between Tang Tui and Chiao Tou, Yunnan. Alt. 7–9000 ft. September 1904." G. Forrest. No. 44.

UMBELLIFERAE.

Carum coloratum, Diels. Sp. nov.

Rhizoma incrassatum. Caules solitarii vel plures, cum vaginis atque pedunculis intense purpurei, glabri, 7–25 cm. longi. Folia basilaria et inferiora cum petiolo laminam fere aequante 5–14 cm. longa, 1–3 cm. lata, composita vel bicomposita, pinnae primariae circ. 4–5 utrinque patentes, secundariae inferae alte trifidae, superae integrae oblanceolato-lineares. Foliorum superiorum vagina magis conspicua, petiolus nullus, lamina decrescens. Involucrum et involucella decidua vel saepius nulla. Umbellae radii 6–12, 1–2·5 cm. longi. Calycis segmenta obsoleta. Petala alba unguiculata, late ovata saepius leviter triloba, ca. 2 mm. longa, 1·5–1·8 mm. lata. Stylopodia purpurea, lata; styli 0·5 mm. longi.

"Plant of 3–6 inches. Flowers white, gynaecium green, stem purple. Dry ledges of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 12–13,000 ft. August 1906." G. Forrest. No. 2874.

"Plant of 4–10 inches. Corolla pure white, gynaecium green. Grassy ledges of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 3060.

Allied to *C. acronemaefolium,* Clarke.

Carum dolichopodum, Diels. Sp. nov.

Caulis basi longe nudus, nodosus; epigaeus foliatus, 5–10 cm. longus, purpurascens. Folia infera basi vagina 2 mm. longa, petiolo 2·5–3·5 cm. longo et lamina ambitu late triangulari, glabra, bicomposita, 6–7 cm. longa, (basi) 8–9 cm. lata praedita. Pinnae primariae 2–4–jugae, secundariae ambitu late triangulari-ovatae, iterum alte sectae, segmenta ultima saepe late cuneato-obovata, trifida vel tridentata. Involucrum nullum. Umbellae radii 5–6. Involucelli phylla pauca, oblanceolata, integra vel tridentata. Umbellulae 10–12–florae. Flores illis *C. colorati* similes nonnunquam paulo majores.

"Plant of 2–4 inches. Petals white, gynaecium dark green. Shady ledges on and at the base of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. August 1906." G. Forrest. No. 2872.

This is very close to *C. coloratum*, Diels, but differing in the long hypogaeous portion of the stem, its stouter habit, the much broader leaf, the broader leaf-segments, which are more closely set.

Carum ? pityophilum, Diels. Sp. nov.

Caulis 0·4–0·75 m. altus, strictus, basi foliis delapsis nodosa, parce foliata. Folia infera vagina latissima inflata subcoriacea nervosa 2·5–3 cm. longa, ca. 2–2·5 cm. lata praedita, deinde breviter petiolata ; lamina ambitu triangularis, ca. 6 cm. longa, 8–9 cm. lata, tricomposita, pinnae primariae patentes, 2–4 utrinque abeuntes, segmenta ultima anguste linearia 2–3 mm. longa ; folia summa fere ad vaginam reducta. Involucrum et involucella nulla vel mox decidua. Umbellae radii 10-20, umbellulae 12–15–florae, pedicelli 3–5 mm. longi. Sepala obsoleta. Petala inaequalia, exteriora radiantia, majora 2–2·2 mm. longa, 1·5 mm. lata, interiora 1·6 mm. longa, omnia late elliptica subrotunda. Ovarium glabrum basi subcordatum, stylopodium pulvinatum, styli brevissimi.

" Plant of $1\frac{1}{2}$–$2\frac{1}{2}$ ft. Flowers white. Open, dry situations in pine scrub on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 10–11,000 ft. October 1906." G. Forrest. No. 3078.

As the fruit is unknown, I am not certain as to the generic place of this species.

Angelica ? rivulorum, Diels. Sp. nov.

Caulis 0·3–0·9 m. altus, striatus, glaber. Folia basalia ad 30 cm. longa, e basi vaginante longius (7–8 cm.) petiolata, simpliciter pinnata, foliola 2-juga, longe petiolulata (petiolulo jugi inferi ca. 5 cm. longo), e basi cordata ovata crenato-dentata, praeter nervos 7–9–palmatos scabrido-pilosos in utraque facie glabra, 7–8 cm. longa, 5–6 cm. lata. Folia superiora mox reducta, trifoliolata. Involucri phylla pauca, linearia, flaccida. Umbellae radii 16–18, superne pilosuli. Involucelli phylla ca. 6–8, oblanceolata vel anguste oblonga, utrinque acuta, apice acutissima, margine pallida, 1–2 cm. longa, 1–2·5 mm. lata. Umbellulae ca. 20–florae, pedicelli 6–8 mm. longi. Calyx obsoletus. Petala obcordata pallide olivaceo-brunnea. Stylopodia crassa, elevata, styli ovario paulo breviores. (Fructus non visus.)

" Plant of 1–3 ft. Flowers pale olive-brown. Whole plant strongly aromatic. Gravelly, boggy ground in running water on mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. August 1906." G. Forrest. No. 2849.

The fruit being unknown, the generic position of this species is not certain. In the inflorescence, it resembles some

Pleurospermum (*e.g. P. decurrens*), but the foliage is very different.

Angelica Forrestii, Diels. Sp. nov.

Caulis striatus, glaber. Folia herbacea, inferiora vagina 5–6 cm. longa, petiolo 6–7 cm. longo praedita, ipsa triternato-partita, ampla, supra glabra, subtus ad nervos parce pilosula, segmenta ultima inaequilateralia argute serrata; superiorum vagina supra petiolum foliaceo-producta, 6 cm. longa atque lata, lamina decrescens. Involucri phylla lanceolata vel linearia, flaccida, inaequalia, deflexa, mox decidua. Umbellae radii 18–26. Involucelli phylla linearia, flores subaequantia, 5–8 mm. longa. Umbellulae 20–30–florae. Sepala minuta, concavo-triangularia. Petala obovata, apice inflexa, 1·5–2·5 mm. longa, 1·2–1·5 mm. lata. Stamina 2–3 mm. longa. Styli brevissimi.

"Plant of 2–3 ft. Flowers green. Whole plant fragrant with a fennel-like odour. Shady, open situations on margins of pine forests on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11,000 ft. July 1906. Yunnan, W. China." G. Forrest. No. 2580.

A very similar plant is Wilson, No. 3688.

Ligusticum modestum, Diels. Sp. nov.

Rhizoma colle rudimentis pristinis fibrosis cinctum. Caules complures, 20–30 cm. alti, straminei. Folia basi vaginata, inferiora petiolata, ambitu anguste ovata, bicomposita, pinnae primariae circ. 3–7–jugae remotae, secundariae iterum fere ad rhachin partitae, segmenta tertiaria linearia, acuta, 2–4 mm. longa, vix 0·5 mm. lata; folium totum cum petiolo ca. 18 cm. longum, 6 cm. latum; superiora mox valde decrescentia. Umbellae longe pedunculatae, basi radiorum dense puberulae. Involucrum nullum. Umbellae radii 8–10. Involucelli phylla in segmenta subfiliformia subfalcata pinnatipartita, 7–8 mm. longa, flores superantia. Umbellulae 10–12–florae. Sepala triangularia stylopodii dimidium subaequantia. Petala obcordata, costata, apice longe inflexa, 1–1·5 mm. longa, 0·8–1 mm. lata. Ovarium ca. 1·5 mm. longum, styli 0.5 mm. longi.

"Plant of 9–12 inches. Flowers greenish-white. Grassy openings in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10–11,000 ft. August 1906." G. Forrest. No. 2856.

An ally of *L. brachylobum*, Franch., but a considerably smaller plant, having much narrower segments of the pinnules and less conspicuous sheaths at the base of the leaves.

Peucedanum olivaceum, Diels. Sp. nov.

Caulis basi fibris petiolorum pristinorum cinctus, glaber, 0·3–0·6 m. altus. Folia firme papyracea, glabra subtus glauca venis reticulata, 7–9 cm. longa, 8–11 cm. lata; infera vagina inflata latissime obovata ca. 4 cm. longa, 2 cm. lata praedita, bicomposita, pinnae primariae petiolulatae 2–3–jugae, secundariae sessiles ambitu late obovatae altius 3–5–incisae lobis mucronulatis; summa reducta integra lanceolata. Umbellae paucae longe pedunculatae. Involucrum atque involucella nulla. Umbellae radii ca. 5–8, umbellulae 10–12–florae; flores nonnulli hermaphroditi, alii ± masculi. Sepala parva, triangularia, persistentia, 0·5–0·8 mm. longa. Petala obscure olivaceo-viridia, anguste obovata apice longius inflexa, 2·5–3 mm. longa, 1·2–2·5 mm. lata. Stamina 2·5–3 mm. longa. Ovarium florum ♀ circ. 2 mm. longum. Stylopodia rufofusca pulviniformia 0·5 mm. alta, styli breves. Fructus ambitu ellipticus 1–1·2 cm. longus, 0·6–0·7 cm. latus coriaceus, valde compressus, late alatus; vittae solitariae; carpophorum bipartitum.

"Plant of 1–2 ft. Flowers dark olive green. Dry situations in shady pine forests on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 9–10,000 ft. May 1906." G. Forrest. No. 2250.

A very distinct species.

Trachydium chloroleucum, Diels. Sp. nov.

Rhizoma crassum. Caules solitarii vel complures, glabri, 10–30 cm. longi. Folia glabra, basalia petiolo basi vaginante 5–7 cm. longo praedita, lamina ambitu ovata, 5–7 cm. longa, bicomposita; pinnae primariae ca. 3–5–jugae, pinnae secundariae subflabelliformes, argute inciso-dentatae, inferae circ. 0·5 cm. longae et latae. Folia superiora petiolo destituta, latius vaginata, minora. Involucri phylla 4–6, pinnatipartita segmentis integris vel iterum ternatis, 1–1·5 cm. longa. Umbellae radii 6–7, 2·5–3 cm. longi, sub apice puberuli, ceterum glabri. Involucelli phylla basi pallida, lata, apice trifida segmentis angustis acutis, 7–8 mm. longa, flores subaequantia. Umbellulae multiflorae, pedicelli scabriusculi. Calycis lobi anguste ovati, ovarii tertiam fere partem attingentes. Petala viridi-alba, late obcordata vel rotunda, apice inflexo. Stylopodia elevata, styli ad 1 mm. longi.

"Plant of 4–7 inches. Flowers greenish-white. Stony, mountain pastureland on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. August 1906." G. Forrest. No. 2873.

"Plant of 6–12 inches. Petals greenish-white, gynaecium dark

green. Grassy openings in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 2886.

Recognised by its broad, fan-like, deeply-toothed leaflets and segments.

Trachydium Forrestii, Diels. Sp. nov.

Caulis ad basin rudimentis paucis fuscis obsessus, 22–125 cm. altus, striatus. Folia plurima ex imo caule orti, petiolo basi conspicue vaginante circ. 6–8 cm. longo praedita, praeter marginem nervosque principales minute scabridos glabra; lamina 4–5 cm. longa et lata, ambitu late triangularis, pinnatipartita, segmenta utrinque circ. 3–4 basi cuneata, iterum alte incisopartita, segmenta ultima lanceolato-linearia apice purpureo-ustulata; infima minus partita, summa petiolo excluso vaginae insidentia. Involucri phylla foliacea, basi late cuneata, integra, apice trifida, segmentis iterum incisis, 1·5–2·5 cm. longa. Umbellae radii 10–14, inaequales sub anthesi 3–8 cm. longi. Involucelli phylla anguste oblonga, integra vel pauci-incisa, purpureo-marginata, flores superantia, 0·5–1 cm. longa. Sepala inconspicua. Petala viridulo-alba, purpureo-marginata, spathulato-obovata, apice integra in unguem angustata, circ. 1·5 mm. longa. Ovarium nitenti-atroviride, styli brevissimi.

"Plant of 9–24 inches. Petals greenish-white, gynaecium glistening dark olive-green. Shady, grassy openings in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10–11,000 ft. August 1906." G. Forrest. No. 2855.

The leaves are larger and finer cut than those of *Trachydium obtusiusculum*, C. B. Clarke, of the Eastern Himalaya; otherwise the plants are similar. From *T. rubrinerve*, Franch., our species differs by longer phylla of the involucel and a different foliage.

Heracleum stenopterum, Diels. Sp. nov.

Caulis 0·9–1·2 m. altus, hispidulus. Folia inferiora herbacea, in utraque facie scabrido-pilosa subtus pallida, ca. 30 cm. longa, 45 cm. lata, vagina purpurascente subinflata amplectente 6–7 cm. longa atque petiolo communi brevi, ca. 2 cm. longo praedita, biternato-partita, segmentis primariis basin versus longe cuneatis iterum partitis lobis lanceolatis, cum partibus basali atque intersegmentariis serratis, apice longe acuminatis, 4–6 cm. longis. Folia summa vaginata, non petiolata, 3–5-pinnatipartita, segmentis iterum incisis, ultimis serratis acuminatis. Umbellae pedunculis 22–28 cm. longis praeditae. Involucrum phyllis paucis reductis mox deciduis effectum vel nullum. Umbellae radii hispidi, 30–40. Involucelli phylla pauca, anguste linearia, umbellulam vix aequantia. Umbellulae ca. 30–40-florae, pedicelli 0·5–1 cm.

longi. Sepala ovarium pilosum subaequantia, lanceolata, acuta. Petala viridulo-lutea, exteriora radiantia.

"Plant of 3–4 ft. Flowers greenish-yellow. Open, shady situations in shady pine forests on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 10–11,000 ft. August 1906." G. Forrest. No. 2847.

In foliage not unlike *H. rotundatum*, Wall., of Nepal. From *H. acuminatum*, Franch., of the Tali neighbourhood, it differs by the hairy leaves with the segments being even more acute, the more numerous rays of umbels and umbellules, and the greenish-yellow petals.

URTICACEAE.

Laportea Forrestii, Diels. Sp. nov.

Caulis superne subflexuosus, pilosulus et stimulis praeditus. Foliorum petiolus 3–6 cm. longus, stimulis armatus; lamina herbacea, hispida nec non stimulis conspersa, suborbicularis vel late ovata, grosse et alte dentata dentibus triangularibus ca. 0·5–1 cm. longis, anguste longeque acuminata, 7–9 cm. longa, 5–7·5 cm. lata. Pseudoracemi axillares, angustissimi elongati, 15–20 cm. longi. Flores ♀ fasciculati, breviter pedicellati. Tepala pilosula. Fructus valde compressus, latissime ovatus inaequilateralis, ca. 1·5 mm. longus, stylus decurvus.

"Valleys of Mekong and Yangtse, common in places. Alt. 5–7000 ft. Yunnan. September 1904." G. Forrest. No. 520.

In habit very similar to *L. grosse-dentata*, Wright, but different by having stinging hairs.

Pilea peperomioides, Diels. Sp. nov.

Caulis (an hypogaeus ?) elongatus crassus, glaber, cinereo-fuscus, foliorum pristinorum cicatricibus confertis notatus. Folia ad apicem caulis conferta carnosa; petiolus laminae peltatae trans basin insertus, 3–6 cm. longus; stipulae scariosae, fuscae, ovatae vel lanceolatae acuminatae acutae, 0·5–1·8 cm. longae, persistentes; lamina late elliptica vel fere orbicularis, 4–4·5 cm. longa, 4–5 cm. lata, obsoletissime undulato-repanda vel integerrima, cystolithis minutis fusiformibus densissime farcta, nervi 5–7–ni (sicci) obsoleti. Inflorescentiae efoliatae, pedunculo 5–7 cm. longo praeditae, paniculatae, rami subflexuosi, primarii 5–7 cm. longi, glomeruli ultimi conferti. Bracteae scariosae, ± fissae. Inflorescentiae ♂ quam ♀ maiores. Flores ♂ quam ♀ multo majores, sessiles; perianthium trans medium 4–partitum, ad 3 mm. longum, segmenta purpurascentia; stamina 4, filamenta 2 mm. longa, antherae latae. Flores ♀ virides minutissimi; perianthii

segmenta 3 inaequalia, vix 0·5 mm. longa; 1 maius cucullato-cymbiforme, 2 minora; ovarium compresso-ovoideum subinaequilaterale, stigma sessile, breve, penicillatum; staminodia nulla.

"Plant of 3–4 inches. Flowers green, minute, foliage succulent. Shady situations on humus-covered boulders on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. July–August 1906." G. Forrest. No. 4667.

"Plant of 3–9 inches. Foliage succulent, flowers pale, yellowish-green. On ledges of cliffs and humus-covered boulders. Extremely local. One of the side valleys of the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–8000 ft. July 1910." G. Forrest. No. 7190.

This is widely different from the only other species with peltate leaves, *P. peltata,* Hance, from the West-River, prov. Canton, by its stouter habit, the persistent stipules, the succulent entire leaves, the long peduncled inflorescence.

Morus longistylus, Diels. Sp. nov.

Frutex 1·5–3·5 m. altus. Rami cortice cinereo-fusco praediti, ramulos in tempore florendi breves gignentes. Folia (nondum matura) petiolata, supra brevissime puberula subtus praecipue ad nervos pilosula, oblique ovata, acuminata, serrata serraturis saepe mucronulatis. Stipulae pallide fuscae dorso puberulae lanceolatae. Spicae ♂ pedunculo circ. 1 cm. longo praeditae, ipsae 1–2 cm. longae; sepala late elliptica, extus pilosa vel glabrescentia, concava, marginibus involuta, 2·5–3 mm. longa; stamina 3·5–4 mm. longa. Spicae ♀ breves subcapitiformes, pedunculo circ. 0·5 cm. longo praeditae, tepala 4 late ovata vel suborbicularia, valde concava, subglabra 1·5 mm. longa. Styli glabri longe (3–3·5 mm.) connati, superne (circ. 2 mm.) liberi papillosi.

"Shrub of 5–12 ft. Flowers yellowish-green. Moist, open situations amongst scrub in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 7–8000 ft. August 1906." G. Forrest. No. 4672.

Allied to *Morus indica,* Linn., but distinct by the less acuminate leaves, which are very slightly hairy. The tepals of the ♂ are broadly elliptical, those of the ♀ not carinate, the styles not hairy as in *M. indica.*

A similar plant, having the foliage more developed and the ♂ spikes larger, is represented in the ♂ state only.

"Shrub of 8–20 ft. Flowers yellowish-green. Shady thickets of side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–9000 ft. June–July 1906." G. Forrest. No. 4669.

VACCINIACEAE.

Agapetes Bulleyana, Diels. Sp. nov.

Frutex patulus, 1·2–2·5 m. altus. Rami lenticellati. Folia pseudoverticillato-conferta, subsessilia, coriacea, in utraque facie glabra, supra rugosa subtus pallida, margine recurvato cartilagineo calloso-denticulata, oblonga vel oblanceolato-oblonga, acuta, basin versus angustata basi ipsa saepe rotundata, 4–8 cm. longa, 1·5–3·5 cm. lata ; nervi supra alte insculpti, subtus prominentes. Racemi a ramis orti, pedunculati, bracteis parvis praediti cum pedunculo parce piloso 1·5–2 cm. longi ; flores subcorymboso-conferti, pedicelli 0·3–1 cm. longi (inferioribus longioribus) sub ovario articulati, colorati, glabri. Dentes calycini triangulares, uninerves, circ. 2·5 mm. longi. Corolla conico-cylindrica, apice angustior, breviter 5–dentata glabra, viridulo-lutea, 8 mm. longa, circ. 4 mm. lata, limbi dentes 0·5 mm. longi. Filamenta 1·5 mm. longa, antherae longe cornutae, 4 mm. longae. Stylus 7 mm. longus.

" Spreading shrub of 4–8 ft. Flowers greenish-yellow. Shady situations in the Ku-tan-ho valley, Salwen-Irrawadi divide. Lat. 25° 55′. Alt. 7–9000 ft. North-west Yunnan. Flow. December 1905." G. Forrest. No. 1069.

This very distinct species seems to be related to *Agapetes glabra* (Griff.), Clarke, which has no spurs on the anthers, and shows many other differences in foliage and inflorescences. At the same time, in looking remarkably like *Pentapterygium rugosum,* the new species shows the close affinity of that small genus to *Agapetes.*

Vaccinium Forrestii, Diels. Sp. nov.

Frutex 1–1·5 m. altus. Ramuli rufidulo-brunnei glabri. Folia petiolo crassiusculo 5–7 mm. longo basi articulato praedita, coriacea, utrinque glabra, subtus pallida (sicca tempore florendi pallide cuprea), oblonga, utrinque angustata, apice acuminata, margine serrulato-repanda, 6–10 cm. longa, 3–3·5 cm. lata ; nervi supra obsoleti, subtus prominuli, nervuli obsoleti. Racemi axillares, bracteis basalibus fuscis dorso puberulis persistentibus, superioribus tenuioribus scariosis purpureis ciliolatis deciduis praediti, 3–5 cm. longi ; pedicelli brevissimi, purpurei, 1–1·5 mm. longi, bracteolis 2 scariosis purpurascentibus deciduis suffulti. Calycis tubus hemisphaericus, segmenta triangularia, apice puberulo-ciliata. Corolla cylindrica, utrinque constricta, 5–6 mm. longa, lobi triangulares breves, intus papillosi.

" Shady thickets on the hills west of Yunnanfu. Lat. 25° 5′. Alt. 7–8000 ft. February 1903." G. Forrest. No. 454.

According to a note on the sheet, this is the same as Henry, No. 10,552, No. 10,552a, No. 13,298, and Ducloux, No. 814, which I have not seen.

Closely allied to *V. mandarinorum*, Diels, of Central China, which differs by its broader leaves, shorter petiole, longer pedicels, and longer corolla.

VALERIANACEAE.

Valeriana barbulata, Diels. Sp. nov.

Rhizoma radices fibrosas longissimas emittens. Caulis 7–15 cm. altus, praeter nodos albido-barbatos fere glaber. Folia infima nonnunquam indivisa, cetera 1–2–jugo-pinnata, 2–3 cm. longa, ad petiolum marginesque pinnarum hispidula, ceterum glabra; foliola infima saepe minuta, media ovata integra vel ± serrata, 4–9 mm. longa; terminale multo majus, ovatum, serratum, 1·5–2 cm. longum, 1–1·3 cm. latum. Corymbus parvus, densiflorus, 1 cm. longus, 1·5–2·5 cm. latus; bracteae pallidae vel roseo-suffusae, lanceolatae, obtusiusculae, basi barbatae, 3–5 mm. longae, ovarium superantes. Ovarium glabrum, 2 mm. longum, demum longius. Corollae roseo-albidae tubus 2·5 mm. longus; limbus brevis, vix 1 mm. longus, 2·5 mm. latus.

"Plant of 3–6 inches. Flowers pinkish-white. Moist, grassy situations in pine scrub on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 10–11,000 ft. September 1906." G. Forrest. No. 2885.

"Plant of 3–6 inches. Flowers pink. Boggy mountain pasture on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. July 1906." G. Forrest. No. 4645.

In habit, this species reminds of *V. pyrolifolia*, Dcne., and *V. flagellifera*, Batal. (Kansu); it is different from the Kansu species by the more entire leaves and composite inflorescences.

Valeriana stenoptera, Diels. Sp. nov.

Rhizoma (an semper breve?) radices fibrosas numerosas demittens. Caulis 15–50 cm. altus basi puberulus, superne praeter nodos subbarbatos glabratus. Folia infima longe petiolata, late ovata, serrata evanida, cetera sessilia, alte pinnatipartita, fere glabra, 5–8 cm. longa, segmentis linearibus integris vel hinc inde incisis, nonnunquam subcurvatis, apicem versus longe attenuatis, 1·5–2 cm. longis. Corymbus simplex vel tripartitus, cymae densiflorae; bracteae lineares apice tenues subcallosae. Ovarium glabrum, 1·5–2 cm. longum. Corolla rosea vel roseo-alba; tubus limbo brevior basi ipsa subito unilateraliter constrictus ideoque gibbus, circ. 2 mm. longus; limbi lobi subelliptici, obtusi, 2·5 mm. longi, 1·5 mm. lati.

"Plant of 6–18 inches. Flowers pinkish-white. Ledges and crevices of cliffs and on limestone drift on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. August 1906." G. Forrest. No. 2705.

"Plant of 9 inches. Flowers pink. Growing on humus-covered boulders, same locality. Alt. 10,000 ft." G. Forrest. No. 2758.

Easily recognised by the narrowly cut leaves, the short gibbous tube of the corolla, and the glabrous ovary.

VERBENACEAE.

2324

Caryopteris Forrestii, Diels. Sp. nov.

Suffruticosus, saepe procumbens, 0·3–1·2 m. altus, omnibus partibus albido-velutinellus. Foliorum petiolus 0·5–1 cm. longus, lamina herbacea, supra viridis, molliter puberula subtus albo-tomentella, subovata vel oblonga, basin versus angustata, apice obtusiuscula, 2–5 cm. longa, 0·5–2·5 cm. lata, nervi primarii subtus prominentes. Inflorescentiae corymbosae et in axillis foliorum superiorum ortae et terminales, conspicue pedunculatae, albido-velutinellae. Flores pedicellati. Calyx subaequaliter 5–fidus, tubus circ. 1·5 mm. longus, rotundatus, segmenta anguste lanceolata, crassiuscula, obtusa, 2–2·5 mm. longa, intus tomentoso-marginata. Corolla viridi-alba, extus velutinella ; tubus rectus, haud gibbus, circ. 2·5 mm. longus, intus ad insertiones staminum barbatus, segmenta 4 superiora subaequalia ovata obtusa circ. 1·5 mm. longa, 1·2 mm. lata, inferius longius (3–4 mm.) concavum, apice dentibus 3 alte trifidis ornatum. Stamina libera exserta, circ. 5 mm. longa. Stylus apice minute bilobus, discus ovarii dimidium subaequans. Calyx fructifer ad 4–5 mm. ampliatus, nuculae semiobovatae dorso puberulae margine subalatae ventre planae 2–2·5 mm. longae.

"A shrub of 3–4 ft. Flowers greenish-white. Dry, stony ground at head of the Teng chuan valley. Elev. 8000 ft. Flow. September 1904." G. Forrest. No. 79.

"Shrubby plant of 1–2 ft., usually prostrate. Valley of the Yangtse below Pung tzu la. Dry, limestone country. Elev. 9000 ft. Fruit, September 1904." G. Forrest. No. 100.

The Pung tzu la specimen is more xerophytic, having more spreading branches and considerably smaller leaves.

Allied to *C. mongolica,* Maxim., but the leaves are larger and the flowers very much smaller.

MONOCOTYLEDONES.

COMMELINACEAE.

Aneilema stenothyrsa, Diels. Sp. nov.

Caules complures basi procumbentes, adscendentes, fere glabri, 15–30 cm. longi, foliati. Folia ad vaginam amplectentem et laminae basin pilosa ceterum glabra, vagina 1–1·5 cm. longa, lamina anguste ovata vel sublanceolata 3–5 cm. longa, 7–12 mm. lata, margine minute scaberula apice apiculo atropurpureo plerumque praedita. Panicula angusta e cymis paucifloris breviter pedunculatis vel subsessilibus composita, 2·5–3 cm. longa, 1·5–2 cm. lata. Florum alabastra nutantia. Sepala sicca hyalino-albida, elliptica, 5 mm. longa, 3 mm. lata. Petala (an semper ?) sepalis minora, coerulea. Stamina fertilia 2–3, filamento barbata ; staminodia 3. Fructus circ. 6 mm. longus, trilocularis, loculi monospermi.

"Plant of 6–12 inches. Flowers white. Boggy situations along the base of the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 6700–8000 ft. June–July 1906." G. Forrest. No. 4847.

Sect. *Dictyospermum,* Clarke ; easily recognised by the small narrow panicle.

LILIACEAE.

Smilax tortuosus, Diels. Sp. nov.

Frutex 1·2–1·8 m. altus, rami valde flexuoso-intricati, hinc inde aculeati, vaginis induratis truncatis dense obtecti, internodia 5–8 mm. longa. Folia ecirrhosa ; vaginae circ. 2 mm. longae auriculatae ; lamina sessilis, elliptica vel ovato-elliptica, demum subcoriacea, 3–3·5 cm. longa, 1–1·5 cm. lata, nervi demum in utraque facie prominuli. Umbellae ♂ pedunculatae, in ramis novellis ex axilla inferiori ortae folio breviores. Pedicelli 3–4 mm. longi. (Planta ♀ non visa.)

" Shrub of 4–6 ft. Flowers green. Open, grassy situations on the margins of pine forests on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. October 1906." G. Forrest. No. 3099.

In the shape of the leaf *S. tortuosus* is not unlike *S. parvifolia,* Wall. ; but the sheaths and flowers are different.

Polygonatum uncinatum, Diels. Sp. nov.

Rhizoma repens. Caulis 25 cm. altus, glaber, basi nudus. Folia 4–5–nim verticillata, glabra, lanceolata, margine anguste revoluta, apice uncinata, 5–6 cm. longa, 1–1·4 cm. lata. Flores

bini vel solitarii fasciculati, penduli, pedicelli 1–1·3 cm. longi. Perigonium album 1·5–1·8 cm. longum, 0·3–0·5 cm. latum, lobi 0·3–0·4 cm. longi, viriduli, apice barbulati. Antherae 6 mm. longae. Ovarium ovoideum, 4–5 mm. longum, sensim in stylum 10 mm. longum angustatum.

"Plant of 1–3 ft. Flowers white, tinged purplish. In pine forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. July–August 1906." G. Forrest. No. 4839.

Polygonatum Stewartianum, Diels. Sp. nov.

Rhizoma repens, incrassatum. Caulis erectus, 30–60 cm. altus, longe nudus, glaber, minute purpureo-maculatus. Folia terna verticillata vel opposita, subtus glauca, ad nervos scabriuscula, anguste vel latius lanceolata, apice uncinata, 7–8 cm. longa, 1–1·6 cm. lata. Flores pedicellati, solitarii vel bini in axillis fasciculati, decurvi penduli, 10–12 mm. longi. Perigonium viridulo-purpurascens, e basi ca. 4 mm. lata sub limbo ad 3 mm. constrictum, limbo iterum ampliatum; limbi lobi exteriores 3 mm. longi, quam interiores ovati longiores et angustiores. Antherae 2 mm. longi. Ovarium late ovoideum, 3 mm. longum; stylus 2 mm. longus, stigma subcapitatum.

"Plant of 1–1½ ft. Flowers pale greenish purple. Dry, shady situations amongst scrub and in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 9–10,000 ft. May 1906." G. Forrest. No. 2185.

"Erect plant of 18–24 inches. Flowers greenish-crimson. In shady pine forests on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 10–11,000 ft. May 1906." G. Forrest. No. 2239.

As to the leaves, this species is similar to *Polygonatum erythrocarpum,* Hua; in the flower, it resembles *P. Delavayi,* Hua. In foliage, *P. Stewartianum* forms a transition from the *Oppositifoliae* group to the *Verticillatae.*

Hemerocallis Forrestii, Diels. Sp. nov.

Planta 30–45 cm. alta. Caulis basi residuis foliorum pristinorum fibrosis dense cincta. Folia 20–35 cm. longa, 1·3–1·7 cm. lata, obtuse-acuminata. Corymbus 8–10-florus, pedicelli 1·5–2 cm. longi, bracteae ovatae vel lanceolatae. Flores rubicundo-aurantiaci, inodori; tubus brevis 1–1·5 cm. longus, sensim in limbum dilatatus; segmenta exteriora oblanceolata, 5·5–6 cm. longa, 1–1·5 cm. lata (sicca), praesertim apicem versus fuscescentia, interiora aequilonga latiora tenuiora.

"Plant of 12–18 inches. Flowers deep reddish-orange, non-fragrant. Dry clefts and ledges of cliffs in side valleys on the eastern flank of the Lichiang Range. Lat. 27° 12′ N. Alt. 9–10,000 ft. June 1906." G. Forrest. No. 2512.

This species is allied to *H. fulva*, Linn., which is cultivated by the natives of Yunnan, and also growing wild (as var. *β angustifolia*, Bak.) in the mountains of the Lichiang district. The new species is different from it in its narrow perianth with a remarkably short tube, the leaves are much broader than those of *H. fulva*, var. *β angustifolia*, which are only 0·4–0·8 cm. wide in the specimens collected near Talifu by Forrest.

Diuranthera minor, C. H. Wright ex Hemsl. in Hook. Icon. Pl. t. 2734.

Folia linearia, 12–20 cm. longa, 0·4–0·6 cm. lata, subrigida, stricta. Antherarum appendices submutici, circ. 1·5 mm. longi. Flores albi, extus roseo-striati. Antherae flavae.

"Plant of 14 inches. Root fleshy; flowers white, exterior marked rose, stamens yellow. Shady situations amongst rocks on mountain meadows on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 10–11,000 ft. September 1906." G. Forrest. No. 2979.

"Plant of 1–2 ft. Flowers watery white, anthers orange. Dry, stony slopes on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 9–10,000 ft. June–July 1906." G. Forrest. No. 4830.

Diuranthera major, Hemsl. in Hook. Icon. Pl. t. 2734.

Folia latilinearia, ad 1·6 cm. lata, magis herbacea, undulata. Antherarum appendices acutiores circ. 3 mm. longi.

"Plant of 1–1½ ft. Flowers white, anthers orange. In scrub and on the margins of thickets on the eastern flank of the Tali Range. Lat. 25° 40′. Alt. 8–9000 ft. June 1906." G. Forrest. No. 4831.

It is doubtful if these two species are really distinct.

Chlorophytum platystemon, Diels. Sp. nov.

Rhizoma fibris radicalibus crasse carnosis praeditum. Folia stricta linearia, basi hyalina alternata, apice acuta, 12–15 cm. longa, 0·3–0·4 cm. lata. Scapus 20–30 cm. altus, simplex vel apice furcato-biramosus. Racemus remotiflorus laxus; bracteae minutae, quam pedunculus primo erectus demum patens vel decurvatus infra medium articulatus 0·4–0·9 cm. longus multo breviores. Perianthii segmenta rotato-expansa, subelliptica vel oblonga, alba, in mediano flava, 9 mm. longa, 4 mm. lata. Stamina filamento brevi dense papilloso utrinque constricto ceterum conspicue dilatato 2·5 mm. longo atque anthera aurantiaca 5 mm. longa praedita. Ovarium subglobosum 1·5 mm. diamet., stylus 8 mm. longus.

"Plant of 9–12 inches. Perianth white with a line of yellow

up the centre of each segment, stamens orange. Dry, stony slopes on the eastern flank of the Lichiang Range. Lat. 27° 15′ N. Alt. 10–11,000 ft. July 1906." G. Forrest. No. 2698.

Allium polyastrum, Diels. Sp. nov.

Caules plerumque solitarii, robusti, 0·3–0·6 m. alti, basi paulo bulboso-incrassati. Vaginae exteriores subfibrosae, ceterae hyalinae apice saepius fissae vel lacerae. Folia basi longius vaginantia, late linearia, caule breviora, 30–40 cm. longa, 0·5–1·8 cm. lata. Bracteae mox marcescentes. Flores numerosi (ca. 30–60); pedicelli stricti, 2–3 cm. longi. Perianthium varie roseum; segmenta mox stellato-expansa vel demum reflexa, anguste oblanceolato- vel spathulato-linearia, uninervia, 6–8 mm. longa, 2–2·5 mm. lata. Stamina libera, edentata, basi paulo dilatata, ca. 10 mm. longa. Ovarium breviter lateque obovatum vel obcordatum, 2–4 mm. longum; stylus 2–6 mm. longus.

"Chung Tien plateau. Alt. 12–13,000 ft. Plant of 1–2 ft. Flowers pale rose. September 1904." G. Forrest. No. 254.

"Plant of 12–30 inches. Flowers bright rose. Grassy slopes on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 3066.

"Plant of 1½–2 ft. Flowers bright rose-magenta. Moist, grassy slopes on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 11–12,000 ft. October 1906." G. Forrest. No. 3088.

"Plant of 1–2 ft. Flowers deep magenta-rose. Moist, rocky grassland on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. August 1906." G. Forrest. No. 5080.

This fine Allium is allied to *A. tuberosum,* Roxb., but the flowers are more numerous and the stamens not shorter than the perianth. From *A. Wallichii,* Kunth., it differs by the outer scales often being fibrous, the margins of the leaves not erose, the flowers more numerous, the petals rose.

Allium polyastrum, Diels, var. **platyphyllum,** Diels. Var. nov.

Caulis basi longius nudus. Folia in caule medio conferta, latiora atque breviora, oblonga vel lanceolata, 15–19 cm. longa, 1·5–3 cm. lata. Pedunculi bini. Flores illis typi simillimi.

"Plant of 12–18 inches. Flowers deep magenta. Grassy openings amongst rocks on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 10–11,000 ft. September 1906." **G. Forrest. No. 2994.**

The habit of this plant is very different from the type, the lower leaves being extraordinarily short and broad. But the flowers being the same, I think it is a local modification only.

Allium Bulleyanum, Diels. Sp. nov.

Bulbi vix evoluti; caulis basi incrassatus, vaginis foliorum pristinorum exterioribus subfibrosis interioribus scariosis varie fissis obtectus. Folia linearia, 20–35 cm. longa, 3–9 mm. lata. Scapus 0·3–0·75 m. altus. Umbella multiflora, spatha mox decidua, pedicelli graciles 2·5–3 cm. longi. Perianthium saturate kermesinum; segmenta anguste elliptica, circ. 6 mm. longa, 2·5 lata. Stamina basin versus dilatata, edentata, ima basi annulari-connata; filamenta 4–5 mm. longa, antherae 2–3 mm. longae. Ovarium obcordatum, stylus quam ipsum dimidio brevior.

"Plant of $1\frac{1}{2}$–$2\frac{1}{2}$ ft. Flowers maroon-purple. Moist, rocky, shady situations on the western slopes of the Tsan shan Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. September 1903." G. Forrest. No. 1052.

"Plant of 1–$2\frac{1}{2}$ ft. Flowers very deep crimson. Damp, shady situations amongst scrub in side valleys on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 9–10,000 ft. September 1906." G. Forrest. No. 5079.

"Plant of 1–2 ft. Flowers deep magenta-rose. Moist, rocky grassland on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. August 1906." G. Forrest. No. 5080.

This species is allied to *A. Wallichii,* differing in the fewer flowered inflorescence, and deep crimson flowers, which are getting darker, not paler, when dried. A similar form is known from Sikkim.

6686 **Allium yunnanense,** Diels. Sp. nov.

Caules complures caespitosi, basi paulum bulboso-incrassati, vaginae exteriores fibrosae. Folia filiformi-linearia, scapo plerumque breviora, 13–25 cm. longa. Scapi 10–40 cm. longi. Bracteae hyalinae vel purpurascentes, mox marcescentes. Flores umbellae valde inaequaliter evoluti: interioribus nonnisi novellis exterioribus jam perfectis; pedicelli papillosi, 15–20 mm. longi. Perigonium anguste infundibuliformi-campaniforme, albidum vel roseum, segmenta suberecta, oblanceolato- vel oblongo-linearia apice nonnunquam plicata recurvata, 10–12 mm. longa, 1·5 mm. lata. Stamina basi ad 1 mm. connata, ceterum libera 5–6 mm. longa basin versus vix dilatata. Ovarium e basi angustata ovoideum 2–3 mm. longum, 2 mm. latum. Stylus 1·5–3 mm. longus.

"Plant of 6–12 inches. Flowers pink. Shady, shrubby

situations on the western slopes of the Tsan shan range near the head of the Yang-pi pass. Lat. 25° 40′. Alt. 9–10,500 ft. September 1905." G. Forrest. No. 914.

"Plant of 6–9 inches. Flowers white veining rose. Crevices of cliffs and dry, shady situations in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 9–10,500 ft. July–August 1906." G. Forrest. No. 2871.

"Plant of 4–12 inches. Flowers bright purplish-rose. Dry situations in and on the margins of pine forests on the eastern flank of the Tali Range. Alt. 8–9000 ft. June 1906." G. Forrest. No. 4833.

"Plant of 4–9 inches. Flowers bright rose. Dry, rocky situations amongst scrub on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 3049.

Also Möng tse (Herb. Kew !).

This species is easily recognised by its very narrow bulbs, narrow leaves, and unequal development of the inflorescence. The flowers are narrow, the segments hardly spreading.

Allium rhynchogynum, Diels. Sp. nov.

Planta basi vestigiis foliorum pristinorum fibrosis obtectum. Folia late linearia, loriformia, 10–20 cm. longa, 8–10 mm. lata. Scapus 16–22 cm. longus. Umbella 6–10-flora; spatha longe persistens, late ovata, scariosa, circ. 1·5 cm. longa, pedicelli 1–2·5 cm. longi. Perianthium roseum, segmenta anguste lanceolata, acuminata, 10–12 mm. longa, 2·5–3 mm. lata. Stamina breviora 5–6 mm. longa, basin versus sensim dilatata, basi ipsa connata. Ovarium gynophoro brevi insertum, late obovatum, 4–5 mm. longum, carpella apice longiuscule rostrata, stylus fere totus inter rostra occultus.

"Cliffs in the valley of the Yangtse between Chu Tien and Shih ku. Alt. 6–7000 ft. 1904." G. Forrest. No. 267.

Allium rhynchogynum is allied to *A. yunnanense,* Diels, but readily recognised by its much broader leaves and the beaked carpels.

Allium Forrestii, Diels. Sp. nov.

Rhizoma elongatum, vestigiis foliorum pristinorum dense fibrosis obtectum. Folia pauca, teretia vel anguste linearia, scapo breviora, 10–12 cm. longa. Scapus 15–25 cm. altus. Umbella 3–5–flora; pedicelli 3–6 mm. longi, spathae caducae. Flores ampli (demum cernui ?), obscure purpurei, in mediano segmentorum intensissime colorati; perianthii campanulati segmenta elliptico-obovata, obtusa, circ. 8 mm. longa, 4·5 cm. lata. Stamina basi ipsa dilatata, connata, circ. 5 mm. longa. Stylus

quam ovarium 3 mm. longum dimidio brevior, apice brevissime trifidum.

"Plant of 6–9 inches. Flowers deep claret-red, darkest on the mid-rib of each segment. Crevices and grassy ledges of cliffs on the eastern flank of the Lichiang Range. Lat. 27° 25′ N. Alt. 11–12,000 ft. September 1906." G. Forrest. No. 3038.

This is a small species remarkable by its large flowers, resembling small specimens of the *A. narcissiflorum*, Vill., of the European Alps, more than any other species.

Lloydia Forrestii, Diels. Sp. nov.

Folia linearia, ca. 4, scapum florentem superantes, 8–15 cm. longa. Scapus 4–11 cm. longus, apice curvatus, ideoque flores penduli; bracteae bracteolaeque foliaceae erectae, suprema flori appropinquata. Flores 1–2. Perianthii sepala angusta, spathulato-linearia, flava, basi aurantiaca, 15–16 mm. longa, 2·5–3 mm. lata. Filamenta pilosa, stamina 10 mm. longa. Ovarium cylindricum, 5–6 mm. longum; stylus 4 mm. longus,. stigma capitatum.

"Plant of 4–6 inches. Flowers yellow, base of perianth orange. Open, grassy situations on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 10–11,000 ft. August–September 1906." G. Forrest. No. 1892.

This seems to be allied to *L. oxycarpa*, Franchet, but the leaves are longer than the scape, the bracts exceed the flower, and the perianth is nodding.

Veratrum stenophyllum, Diels. Sp. nov.

Caulis 0·3–0·8 m. altus, basi vaginarum foliorum pristinorum fibris atrofusis cinctus, praecipue superne densius pubescens, apice nonnunquam subtomentellus. Folia lanceolato-linearia vel oblanceolato-linearia, nonnunquam subfalcato-curvata, 15–45 cm. longa, 1·5–5 cm. lata. Bracteae inferiores lanceolatae dimidium ramorum fere aequantes, superiores decrescentes. Flores ♂ minores quam ceteri, perianthii segmenta basi magis contracta, aurea, extus viridia. Flores subhermaphroditi mediocres, stamina 3·5–4 mm. longa, carpella 3–3·5 mm. longa. Flores ♀ majores, perianthii segmenta anguste ovata, 8–9 mm. longa, 4 mm. lata, viridia. Staminodia 3–3·5 mm. longa, carpella lata 2–2·5 mm. longa. Capsula sepala fere duplo superans.

♀ "Plant of 1–2½ ft. Flowers green. Mountain meadows on the margins of pine forests on the eastern flank of the Lichiang Range. Lat. 27° 20° N. Alt. 9500–11,000 ft. July 1906. N. W. Yunnan, China." G. Forrest. No. 2635.

♂ "Plant of 1½–3 ft. Flowers green. Grassy, shady openings

in and on the margins of pine and mixed forests on the eastern flank of the Tali Range. Lat. 25° 40′ N. Alt. 8–10,000 ft. June–August 1906." G. Forrest. No. 4663.

" Plant of 1½–3 ft. Flowers golden yellow, exterior veined green. Open, grassy situations in pine forests on the eastern flank of the Lichiang Range. Lat. 27° 20′ N. Alt. 10–12,000 ft. September 1906." G. Forrest. No. 3039.

Although the classification of *Veratrum* is very unsatisfactory, I think Forrest's plants may be considered a new species, recognised by its very narrow leaves and bracts. It is allied to *V. dahuricum,* Turcz. There are several other forms of the genus in Western China.

SCITAMINEAE.

Hedychium Forrestii, Diels. Sp. nov.

Caulis 0·6–1·2 m. altus, glaber. Folia (summa) : vagina ca. 15 cm. longa, petiolo brevi, lamina anguste lanceolata, glabra, apice tenuissime acuta, circ. 50 cm. longa, 6–6·5 cm. lata. Spica cylindrica, 20–25 cm. longa. Bracteae anguste ovatae sed margine inflexo sublineares angulo acuto patulae, 4–5 cm. longae, 2–3–florae. Calyx bractea brevior. Corollae tubus 4–5·5 cm. longus, lobi sublineares (torquati ?) 4 cm. longa, 0·3–0·6 cm. lati. Staminodia late elliptica alba 3–3·5 cm. longa, 1·2–1·5 cm. lata. Labellum eis simile, sublatius (?). Stamina 3 cm. longa.

" Plant of 2–4 ft. Flowers white. Open, moist situations in the Tali valley. Lat. 25° 40′ N. Alt. 6700 ft. July 1906." G. Forrest. No. 4812.

A similar plant seems to be Hancock, No. 387, from Red River, Southern Yunnan, in Herb. Kew ; I have not dissected its flower.

This species is different from *H. coronarium* by its narrower spreading bracts, the narrower segments of the corolla and broader staminodes. I could not find out some of the details of the flower without destroying the specimen. The description must be completed from living specimens.

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